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Vulcanization

Without the Use of Sulphur

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¶ Dr. Iwan Ostromislensky, native of Moscow, Russia, received his degrees of Ph. D. and M. D. at the University of Zurich, Switzerland. He also has the degree of C. E. (Chemical Engineer) from Karlsruhe Polytechnicum.

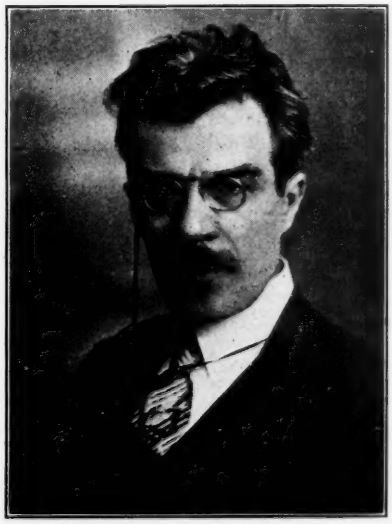
¶ In his own laboratory at Moscow, from 1911 to 1921, he conducted researches in chemicotherapy and on caoutchouc and its analogs. During that period he made his remarkable discoveries relating to the vulcanization of rubber without sulphur.

¶ In 1921 he came to America, and for three years and a half continued his researches in the General Laboratories of the United States Rubber Co. in New York, N. Y. His work there was on vulcanization, synthetic rubber, and many other related chemical problems.

¶ The data contained in the following article exhibit the physical constants of numerous practical rubber mixings cured by symmetrical trinitrobenzene and record the accelerating effects of many ingredients in the new type of vulcanization, which do not act as accelerators of vulcanization in the cure of rubber with sulphur.

As far back as 1915 I described the various methods of vulcanizing rubber without the use of sulphur[1] which I was the first to discover. At the same time these researches gave rise to an international controversy in scientific circles[2]. For reasons beyond my control I have not until now been able either to publish the results of my physical or strictly technical tests of rubbers vulcanized by my new methods, or to place numerical valuations on their physical properties.

Many chemists who have repeated my experiments, or course under somewhat different conditions, often obtained results that did not coincide with mine. In consequence a number of discrepancies have gradually crept into the literature and in places even generalizations that are contrary to fact (C. Harries). Among others, B. D. Porritt[3] claims that 1.3.5. trinitrobenzene, although a vulcanizing agent for rubber, is inactive in the absence of oxides. This statement, as will be shown subsequently, is incorrect. Moreover, some of the experimenters have come to the conclusion that the vulcanization of rubber without sulphur cannot be applied practically in the rubber industry[4].



Dr. Iwan Ostromislensky

Experimenters Set Right

I would begin by pointing out that most of the writers who applied my methods made the fundamental mistake of using too much of the vulcanizing substance. For example, in many instances they applied 1.3.5. trinitrobenzene (TNB) to the amount of 6 to 8 per cent, whereas it should never be used in quantities exceeding 3 per cent (better even 2 per cent) on the weight of the rubber. Further, all rubbers vulcanized with TNB should contain protective agents to prevent oxidation and aging. As such protective agents, a comparatively large amount of various oxides (PbO, ZnO, etc.) may be used, or else a certain amount (about 0.3 to 1.0 per cent) of aromatic amines, such as aniline, or naphthylamines, etc.

TNB Cured Product Superior to Sulphur Cured

The object of the present article is to point out that rubber which has been vulcanized without the use of sulphur in the correct way is a very

NOTE: Footnotes on next page.

Table I. Physical Properties of Rubber Vulcanized with 1.3.5. Trinitrobenzene.

Tensile is given in pounds per square inch. Set and stretch are given in inches. The first group of physical-test figures under each experiment number indicates the results obtained twenty-four hours after curing. The second group of figures indicates the results obtained after aging.

The aging of the rubber was determined by heating the sample under test to 235° F. for three hours in a large steam-jacketed boiler, uniform temperature being maintained by a ventilator fan.

The tensile, set, and stretch of the vulcanizates recorded were tested with a Scott apparatus using dumb-bell form test pieces.

Experiment No.	1	2	3	4	5*	6	7	8*	9	10	11
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100	100
1.3.5. Trinitrobenzene	2	2	2	2	1	4	6	2	2	2	2
Aniline	1	0	0	0	0.2	1	1	1	1	1	1
Zinc oxide (Kadox)	150	150	150	150	150	150	150	150	100	...	...
Litharge	...	...	...	...	...	...	...	...	...	30	60
Sulphur	...	...	2	8	...	...	...	...	...	...	...
Minutes of cure	25	30	25	30	...	45	75	...	75	30	15
Tensile	3665-2500	3209-2560	2745-2755	2730-2325	...	1400	735	...	2345-1675	2260-1310	2515-1310
Set	0.17-0.18	0.2-0.2	0.17-0.22	0.35-0.32	...	0.04	0.1	...	0.12-0.08	0.05-0.05	0.08-0.1
Stretch	7.8-6.8	7.2-5.9	7.6-7.7	7.9-6.7	...	5.0	4.3	...	6.4-5.8	7.0-6.5	8.4-6.2
Minutes of cure	30	60	30	60	...	...	90	...	90	60	20
Tensile	3520-2215	3280-2390	2730-2975	2860-2695	...	...	593	...	2920-1980	2275-1230	2410-1240
Set	0.2-0.15	0.18-0.15	0.22-0.22	0.42-0.32	...	...	0.06	...	0.14-0.11	0.06-0.06	0.09-0.08
Stretch	7.6-6.5	6.1-5.5	7.4-7.0	7.1-6.7	...	...	4.5	...	6.7-6.2	7.0-6.5	8.3-6.0
Minutes of cure	35	120	40	120	...	...	...	...	105	...	...
Tensile	3450-2410	3130-2285	2785-2610	2450-1590	...	...	...	...	2895-1980	...	...
Set	0.2-0.17	0.22-0.15	0.21-0.19	0.44-0.18	...	...	...	...	0.18-0.11	...	...
Stretch	7.6-6.6	6.0-5.7	7.3-6.9	6.5-4.6	...	...	...	...	6.8-6.3	...	...
Minutes of cure	40	25	...	...	...	...	...	...	120	...	...
Tensile	3600-2270	3035-2390	...	...	...	...	...	...	2625-1870	...	...
Set	0.19-0.18	0.20-0.16	...	...	...	...	...	...	0.12-0.11	...	...
Stretch	7.6-6.6	6.4-6.7	...	...	...	...	...	...	6.5	...	...
Minutes of cure	...	20	...	...	...	...	...	...	...	...	...
Tensile	...	3025-2510	...	...	...	...	...	...	...	...	...
Set	...	0.18-0.21	...	...	...	...	...	...	...	...	...
Stretch	...	6.6-6.3	...	...	...	...	...	...	...	...	...

5. Undercured in 180 minutes.
8. This stock in a mold placed in a constant temperature oven cured completely in 5 hours at 95° C. An uncured product is obtained in 17 hours at 50° C.

Experiment No.	12	13	14	15	16	17*	18*	19	20	21	22
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100	100
1.3.5. Trinitrobenzene	2	2	2	2	2	2	2	2	2	2	2
Aniline (Kadox)	1	1	1	1	1	1	1	1	1	1	1
Litharge	100	...	...	...	...	...	...	...	...	...	...
Magnesium oxide	...	20	30	50	75	...	...	...	...	...	...
Carbon black	...	...	...	...	...	175	...	...	...	...	...
Kieselguhr	...	...	...	...	...	...	10	20	30	40	50
Minutes of cure	5	75	75	75	50	30	90	90	90	30	60
Tensile	1045-1090	1710-510	1545-1070	1485-1085	1315-740	955-885	1570-420	2000-840	1690-1360	2130-1642	3170-2240
Set	0.07-0.1	0.14-0.05	0.09-0.07	0.10-0.08	0.12-0.10	0.14-0.14	0.05-0.04	0.05-0.05	0.05-0.07	0.09-0.08	0.09-0.07
Stretch	6.3-5.2	8.7-6.8	7.3-7.1	7.6-6.2	5.8-5.1	4.2-4.3	6.9-5.1	6.1-5.0	5.5-5.3	6.4-5.7	5.2-4.4
Minutes of cure	15	90	90	90	75	...	105	105	105	45	90
Tensile	1910-965	1913-790	1760-995	2120-1102	1355-1116	...	1525-430	1880-905	2205-1220	2205-1720	3445-2085
Set	0.09-0.09	0.08-0.07	0.08-0.08	0.10-0.08	0.10-0.10	...	0.03-0.01	0.08-0.05	0.06-0.04	0.1-0.09	0.1-0.08
Stretch	6.4-5.4	8.4-6.8	8.7-6.9	8.7-6.5	6.0-5.9	...	6.5-5.3	6.1-5.3	6.0-5.0	6.3-5.8	5.2-4.1
Minutes of cure	25	105	105	105	90	...	120	120	120	60	105
Tensile	1650-910	2110-290	1910-1155	1925-1255	1390-975	...	1612-340	1760-780	2225-1370	2105-1975	3295-1880
Set	0.10-0.06	0.08-0.04	0.07-0.10	0.12-0.09	0.10-0.10	...	0.07-0.01	0.05-0.05	0.09-0.06	0.09-0.09	0.05-0.06
Stretch	5.8-5.3	8.5-5.0	8.8-6.8	7.7-6.5	5.9-5.6	...	6.7-4.6	6.0-5.1	5.9-4.8	6.3-5.6	4.9-3.9
Minutes of cure	35	120	...	...	105	...	160	...	...	90	...
Tensile	1105-645	2200-475	...	...	1275-940	...	...	...	...	2350-1785	...
Set	0.07-0.07	0.07-0.04	...	...	0.10-0.10	...	...	...	...	0.1-0.09	...
Stretch	5.3-4.6	8.6-6.3	...	...	5.7-5.4	...	...	...	...	6.0-5.3	...
Minutes of cure	...	...	...	...	...	...	...	...	...	105	...
Tensile	...	...	...	...	...	...	...	...	...	2370-1585	...
Set	...	...	...	...	...	...	...	...	...	0.09-0.06	...
Stretch	...	...	...	...	...	...	...	...	...	6.1-5.2	...

17. This stock cures completely in 5 minutes at 141° C. All of the products from 5 to 60 minutes' cure are like linoleum and brown in color.
18. Badly overcures in 160 minutes.

valuable product, particularly from a practical standpoint. Not only is it so good as rubber that has been vulcanized with sulphur, but it often displays more valuable physical properties as compared with the latter. It seems to me that every specialist who looks through the tables attached to this article carefully and from an unbiased point of view must agree that the "oxygen" vulcanization of rubber discovered by me is in all respects on a par with the classical sulphur-cured rubber that was discovered by Charles Goodyear in 1839.

As to the mechanism of the vulcanization of rubber, it seems to me that the different observations which I have made in the course of many years' work have in all respects corroborated the theory which I expounded in 1915 and which has been reviewed in many of the English and American journals. In his article entitled "Ueber Aggregation und

[1] *J. Russ. Chem.-Phys. Soc.*, 47, pp. 1,441, 1,453, 1,462, 1,467, 1,885, 1,904, (1915). For translations and reviews of these articles see *Chem. Abstracts*, 10, pp. 1,943, 1,946, 3,177, (1916); *Ibid*, 14, p. 235, (1920); *J. Chem. Soc.* 110-i, p. 278, (1916); *J. Soc. Chem. Ind.*, 35, pp. 59, 370, (1916); *Ibid*, 38, 955a, (1919); INDIA RUBBER WORLD, 54, pp. 410, 536, (1916); *Ibid*, 55, 65, (1916); *Ibid*, 61, 151, (1919); *India Rubber J.*, 52, pp. 467, 469, (1916); *Chem. & Met. Eng.*, 16, 161, (1917) *Caoutchouc & gutta-percha*, 13, 8,864, 8,888, 8,946; *Ibid*, 16, p. 9,701, (1919) *Ibid*, 20, p. 11,778, (1923); *Chem. Zentr.* pp. 774, 786, 911, 955, (1916); *Z. angew. Chem.*, 30, II, 48, (1916); *Gummi-Ztg.*, 30, 1,102, (1916); *Ibid*, 34, p. 275, (1920); *Chem.-Tech. Reportorium*, 40, 424, (1906); *Z. Untersuch. Leben.*, 38, 325, (1919); *Kunststoffe*, 12, p. 151, (1922). A more or less complete digest of my work will be found in Pearson's "Crude Rubber and Compounding Ingredients," p. 275, N. Y., 1918, and in B. T. Brook's "The Chemistry of Non-Benzenoid Hydrocarbons and Their Derivatives," p. 137, N. Y., 1922.

[2] H. P. Stevens, "Problems of Vulcanization by Nitrobenzene." *Caoutchouc & gutta-percha*, 13, 8,880, (1916); E. Buntschoten *Chem. Weekblad*, 15, 257, (1918); *Rubber Age*, 5, 291, (1919); *Chem. Abstracts*, 12, 1,518, (1918); *J. Chem. Soc.*, 114-i, 503, (1918); *Kolloid Z.*, 23, 25, (1918); INDIA RUBBER WORLD, 60, 559, (1919); *India Rubber J.*, 56, 719, (1918); *J. Chem. Ind.*, 2,119; *Z. angew. Chem.*, 31, II, 292, (1918); *Gummi-Ztg.*, 32, 692, (1918); *Chem. Zentr.*, 1918, I, 983; *Le Caoutchouc & gutta-percha*, 16, 9,765, 9,880, (1919).

[3] *India Rubber J.*, 52, (1916); *Chem. Abstracts*, 11, 223, (1917); *Scit. American*, 82, 374, (1916); *J. Soc. Chem. Ind.*, 35, 986, (1916).

[4] The Japanese experimenter, K. Sumitomo, on the contrary, used trinitrobenzene to vulcanize insulation for copper wire without applying sulphur. See Japanese patent No. 31,500, (1917). *Chem. Abstracts*, 12, 108, (1918). See also E. Hemming, "Plastic and Molded Electrical Insulation," p. 301, (1923), N. Y. Further, H. P. Stevens investigated the vulcanization of rubber cements by means of trinitrobenzene in the presence of MgO, PbO or the litharge product of a fatty oil.

Table I—Continued

Experiment No.	23*	24	25	26	27*	28*	29*	30*	31*	32*	33
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100	100
1.3.5. Trinitrobenzene	2	2	5	2	2	2	1	0.5	0.3	2	2
Aniline	1	0	1	1	1	1	0	0	0	1	1
Litharge	...	...	...	...	...	30	30	30	30	32	25
Carbon black	...	100	100	120	155	100	100	100	100	35	30
Kieselguhr	100	...	...	...	...	...	...	...	...	...	...
Minutes of cure	30	20	60	60	...	5	30	30	60	15	30
Tensile	2300-2230	2140-1830	2025-1690	2370-1945	...	1970-1565	1635-1425	1590-1335	...	2450-1985	2575-1655
Set	0.12-0.1	0.18-0.2	0.09-0.03	0.17-0.1	...	0.13-0.11	0.09-0.1	0.12-0.12	...	0.15-0.17	0.07-0.1
Stretch	3.4-3.7	4.0-3.7	2.4-2.3	3.3-2.8	...	3.5-3.0	2.7-2.6	3.1-2.9	...	5.0-4.8	4.9-4.4
Minutes of cure	20	30	90	90	...	10	45	45	...	30	45
Tensile	2470-1985	2265-1760	1890-1595	2210-2110	...	2360-2415	1735-1575	1330-1635	...	2020-1775	2830-1615
Set	0.19-0.16	0.11-0.11	0.05-0.04	0.13-0.11	...	0.05-0.06	0.1-0.09	0.1-0.13	...	0.1-0.07	0.1-0.09
Stretch	4.2-3.8	3.6-3.1	2.1-2.0	3.1-2.7	...	2.7-2.8	2.9-2.5	2.7-3.1	...	4.7-4.0	5.3-4.1
Minutes of cure	60	60	105	...	...	20	60	60	...	45	60
Tensile	2450-2010	2265-1905	1875-1370	...	...	2525-2435	1585-1285	1430-1425	...	2055-1410	2695-1630
Set	0.07-0.09	0.08-0.08	0.15-0.05	...	...	0.04-0.07	0.1-0.04	0.12-0.12	...	0.11-0.07	0.11-0.11
Stretch	3.3-2.9	3.1-2.8	2.2-2.1	...	...	2.7-2.6	2.5-2.3	2.7-2.7	...	4.4-3.8	5.0-4.9
Minutes of cure	105	...	...	...	...	...	...	...	...	...	...
Tensile	2105-1990	...	...	...	...	...	...	...	...	...	...
Set	0.07-0.08	...	...	...	...	...	...	...	...	...	...
Stretch	2.8-2.9	...	...	...	...	...	...	...	...	...	...

*
23, 28, 29, and 30. These stocks may be used for the production of leather substitutes. They present beautiful, shining black non-blooming surfaces.
27. Vulcanization complete in 5 minutes at 141° C. The products are very hard and brittle. They cannot be removed from the mold without injury. They have no stretch, set, or trace of elasticity. The maximum of carbon black that can be milled into rubber is 155 per cent by weight.
28. Vulcanization of this mix for 10 days at room temperature yields a product giving the following physical tests: tensile, 905-1220; set, 0.54-0.19; stretch 4.8-3.0.
31. Overcures at 60 minutes at 141° C.
32. All cures reported are overcures. This stock will cure at room temperature in about 40 hours.

Experiment No.	34*	35	36	37	38	39*	40	41*	42	43	44
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100	100
1.3.5. Trinitrobenzene	2	2	2	2	2	2	2	2	2	2	2
Aniline	1	1	1	1	1	1	1	1	1	1	1
Litharge	30	30	60	10	5	30	30	30	30	...	...
Magnesium oxide	...	...	...	...	...	...	...	...	...	5	10
Carbon black	10	20	10	10	5	...	...	...	...	30	30
Carborundum	...	...	...	...	...	...	...	20	20	...	...
Graphite	...	...	...	...	...	130	20	...	...	...	...
Minutes of cure	5	5	5	5	45	10	15	75	5	30	75
Tensile	2704-1332	2770-1877	2121-1582	2160-1186	2098-1063	1485	2100-1592	1550-555	1780-885	2737-1750	2810-1765
Set	0.11-0.09	0.1-0.11	0.12-0.08	0.06-0.04	0.05-0.04	0.26	0.12-0.11	0.09-0.06	0.13-0.12	0.11-0.07	0.08-0.11
Stretch	6.7-5.6	6.1-5.5	6.7-6.0	6.5-5.6	6.3-5.5	5.3	6.8-6.4	6.5-6.0	8.0-7.1	6.2-5.2	6.4-5.2
Minutes of cure	10	10	10	10	60	25	35	...	15	45	...
Tensile	1866-915	2600-1664	2431-1515	2630-1071	2396-815	1180-920	2105	...	1400-630	2735-1700	...
Set	0.07-0.07	0.1-0.06	0.09-0.08	0.07-0.03	0.06-0.03	0.25-0.24	0.12	...	0.10-0.09	0.09-0.06	...
Stretch	6.0-5.1	6.0-5.1	6.6-5.6	6.4-5.2	6.7-5.1	4.9-4.7	6.5	...	7.5-6.4	5.9-5.2	...
Minutes of cure	15	15	15	20	75	...	...	...	30	75	...
Tensile	1445-710	3080-1895	2345-1330	2500-1154	2100-610	...	...	...	1380-365	2315-1700	...
Set	0.09-0.05	0.12-0.11	0.1-0.07	0.1-0.04	0.05-0.02	...	...	...	0.08-0.04	0.1-0.06	...
Stretch	5.4-4.2	6.5-5.4	6.2-5.5	6.4-5.3	6.2-5.0	...	...	...	7.1-4.8	5.4-4.6	...
Minutes of cure	...	30	30	30	90	...	...	...	45	90	...
Tensile	...	2370-1635	1705-1630	2225-1265	1840-650	...	...	...	1000-350	2620-1670	...
Set	...	0.12-0.09	0.07-0.08	0.08-0.06	0.04-0.03	...	...	...	0.08-0.05	0.1-0.05	...
Stretch	...	5.5-4.6	5.7-5.6	6.6-5.3	5.9-5.1	...	...	...	6.3-4.9	5.3-4.7	...
Minutes of cure	...	45	...	60	...	...	...	...	...	105	...
Tensile	...	2135-1475	...	1225-365	...	...	...	...	...	2450-1935	...
Set	...	0.1-0.07	...	0.05-0.03	...	...	...	...	...	0.1-0.06	...
Stretch	...	5.5-4.6	...	5.3-3.3	...	...	...	...	...	5.2-4.8	...
Minutes of cure	...	60	...	...	...	...	...	...	...	120	...
Tensile	...	2345-1275	...	...	...	...	...	...	...	2000-1590	...
Set	...	0.07-0.03	...	...	...	...	...	...*	...	0.09-0.05	...
Stretch	...	5.0-4.7	...	...	...	...	...	...	...	5.6-4.5	...

*
34. Cures of 15 minutes and over are overcured.
39. Vulcanization complete in 2 minutes at 141° C.
41. Overcured. The carborundum was too coarse. Individual sharp particles of it cut the vulcanizate when the latter was stretched giving too low tensile tests.

Desaggregation" the German scientist Harries[5] says: "Auf die Beziehung zwischen meinen Untersuchungen und denen Ostromyslensky's ist merkwuerdigerweise niemand aufmerksam geworden."[6] On this question I still maintain my former point of view and I have no doubt whatever that there is not a single point in common between my observations and my theory and those of Harries.

Production of TNB

In the experiments described in this article in Tables I and II, we used as a vulcanizing substance almost exclusively symmetrical (1.3.5.) trinitrobenzene, which I shall hereafter designate for brevity's sake by the letters TNB. We produced this substance, in accordance with the data we found in the literature, by splitting off carbon dioxide from the corresponding trinitrobenzoic acid in an aqueous solution; the latter we obtained in turn by oxidizing trinitrotoluol (which is a very cheap product, especially in post-war times,) by means of chromic acid. Among other things we succeeded in greatly simplifying the technical phases of this well-known process and were also able to obtain a higher yield of TNB.

We would mention that although TNB is ignited by an open flame, yet it only flashes but does not explode. Of course, a blow with a hammer as well as pulverization of TNB in a mortar will not cause any explosion either. TNB does not detonate at the explosion of mercuric fulminate. It detonates only when this substance explodes in the presence of tetryl. It follows that TNB is not dangerous as far as explosibility is concerned.

Toxicity of TNB

As to the toxicity of TNB, it is far less toxic than aniline or even benzol. When carefully and properly handled, especially in the pulverization stage, TNB, to my knowledge, never once caused any case of dermatitis or of any other skin disease among the chemists or hands working in this line. But in those cases where it was handled without gloves or where its dust was inhaled, it has been known to bring on the symptoms of TNB poisoning, (local swelling of the skin,

[5] *Ber. Deut. Chem. Ges.*, 56, p. 1,051, (1923). In this article Harries maintains that I consider vulcanization, as such, to be a process of oxidizing rubber. Nowhere did I make this assertion.

[6] In translation: "So far nobody has yet, wonderful to say, remarked upon the connection between Dr. Ostromislensky's and my investigations."

Table I—Continued

Experiment No.	45	46	47*	48	49	50	51	52*	53*	54*	55*
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100	100
1.3.5. Trinitrobenzene	2	2	2	2	2	2	2	2	2	2	2
Aniline	1	1	1	1	1	1	1	1	1	1	1
Litharge	...	...	30	30	60	10	30	5	10	...	...
Magnesium oxide	20	20	...	...	...	...	...	...	...	...	...
Carbon black	20	35	...	...	...	...	30	2	2	100	...
Kieselguhr	...	...	30	50	30	60	30	5	5	20	...
Cadmium sulphide	...	...	...	...	...	...	...	...	...	...	75
Minutes of cure	60	90	40	10	5	60	10	10	25	60	180
Tensile	2435-1365	2790-2430	2430-2145	2705-2020	2565-2040	2950-2165	3120-2435	2515-1425	2060-1545	2285-1865	1690-1309
Set	0.11-0.07	0.16-0.1	0.17-0.14	0.24-0.2	0.2-0.17	0.26-0.09	0.22-0.19	0.08-0.07	0.10-0.01	0.14-0.12	0.12-0.1
Stretch	6.3-5.0	5.4-5.1	6.2-5.9	7.1-5.9	6.6-6.3	5.3-5.2	5.6-5.1	7.6-6.7	6.3-6.0	3.3-2.8	7.5-6.8
Minutes of cure	...	105	60	15	10	75	15	25	40	90	160
Tensile	...	2805-2355	2380-1425	2735-2000	3020-2405	2825-1970	3310-2460	1810-1320	2230-1325	2220-2070	...
Set	...	0.15-0.1	0.12-0.11	0.2-0.16	0.2-0.18	0.23-0.19	0.19-0.16	0.07-0.04	0.09-0.07	0.12-0.11	...
Stretch	...	5.4-5.1	6.2-5.3	6.7-5.5	7.1-6.1	5.4-5.0	5.3-5.1	6.2-5.8	6.2-5.5	2.9-2.8	...
Minutes of cure	...	120	...	20	15	90	30	40	55	...	...
Tensile	...	2635-2138	...	2395-1780	2835-2540	2795-2285	2985-2400	2125-1265	1580-1420	...	...
Set	...	0.1-0.1	...	0.21-0.2	0.17-0.19	0.23-0.23	0.21-0.18	0.06-0.06	0.08-0.06	...	...
Stretch	...	5.0-4.8	...	5.8-5.7	6.7-6.2	5.3-5.3	4.9-5.0	6.5-5.8	5.8-5.9	...	...
Minutes of cure	...	...	...	25	...	105	...	...	...	...	...
Tensile	...	...	...	2990-2500	...	2795-2280	...	...	...	...	...
Set	...	...	...	0.22-0.2	...	0.24-0.21	...	...	...	...	...
Stretch	...	...	...	6.4-5.7	...	5.3-5.3	...	...	...	...	...
Minutes of cure	...	...	...	55	...	...	...	...	...	...	...
Tensile	...	...	...	2560-2270	...	...	...	...	...	...	...
Set	...	...	...	0.2-0.21	...	...	...	...	...	...	...
Stretch	...	...	...	5.9-5.6	...	...	...	...	...	...	...
Minutes of cure	...	...	...	70	...	...	...	...	...	...	...
Tensile	...	...	...	2490-1805	...	...	...	...	...	...	...
Set	...	...	...	0.21-0.2	...	...	...	...	...	...	...
Stretch	...	...	...	5.8-5.1	...	...	...	...	...	...	...

*

47. A driving belt made of this stock proved better, and more durable in service than one made of sulphur cured stock.
52 and 53. These stocks were used successfully for the production of rubber cements in benzol on black tire tread stocks. It remains to be determined if this solution will become altered in time at room temperature, for example, by coagulating.
54. Leathery quality. Compare stocks 23 to 31.
55. Undercured in 160 minutes at 141° C.

Experiment No.	56	57	58	59	60	61*	62*	63	64*	65	66
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100	100
1.3.5. Trinitrobenzene	2	2	2	2	2	2	2	2	2	2	2
Aniline	0	0	0	0	0	0	0	1	1	1	1
Zinc oxide (Kadox)	0	0	50	20	50	...	120	...	...	...	100
Litharge	...	...	...	...	+50g. HgS	...	...	30	30	30	...
Magnesium oxide	5	30	...	...	...	...	...	...	...	...	...
Carbon black	...	...	...	...	...	...	...	...	...	...	20
Aluminum oxide	...	...	...	...	...	...	...	...	...	30	...
Silica	...	...	...	...	...	...	...	...	30	...	...
Kieselguhr	...	...	...	...	...	...	...	30	...	...	...
Calcium sulphide	...	...	...	...	...	100	...	...	...	...	...
Cadmium sulphide	75	75	75	75	...	...	...	...	...	...	...
Minutes of cure	30	10	45	...	45	...	75	5	5	...	20
Tensile	2730-2225	2640-2130	1695-1220	...	1175-500	...	1600-1700	1895-1455	2300-1725	...	3210-2845
Set	0.11-0.12	0.13-0.14	0.12-0.10	...	0.12-0.08	...	0.1-0.1	0.20-0.19	0.08-0.12	...	0.17-0.18
Stretch	7.2-7.7	6.9-7.3	6.3-5.9	...	7.9-7.1	...	4.4-5.2	7.1-7.1	7.7-7.6	...	6.6-6.3
Minutes of cure	45	15	60	45	60	...	...	10	10	...	35
Tensile	2530-1585	2245-1760	1925-1640	1860-1615	1870-825	...	...	2020-1440	2195-1355	...	3210-2750
Set	0.10-0.11	0.11-0.10	0.13-0.11	0.13-0.13	0.11-0.09	...	...	0.17-0.20	0.09-0.10	...	0.18-0.16
Stretch	7.1-7.2	6.4-6.2	6.6-6.6	7.5-7.6	8.3-7.4	...	...	6.8-6.9	7.5-6.8	...	6.1-5.8
Minutes of cure	...	30	...	60	75	45	...	20	15	15	50
Tensile	...	2465-1520	...	1835-1645	1885-960	1295-1105	...	1560-1380	1650-1290	1445-850	3395-2780
Set	...	0.11-0.08	...	0.11-0.12	0.11-0.08	0.16-0.16	...	0.13-0.15	0.09-0.07	0.12-0.14	0.25-0.17
Stretch	...	6.4-5.9	...	7.3-7.0	8.0-7.0	6.5-6.3	...	6.1-6.2	6.6-6.6	7.9-7.4	6.4-5.6
Minutes of cure	...	...	...	120	90	60	...	30	20	20	60
Tensile	...	...	...	1790-1740	1225-1025	1215-1075	...	1540-1125	1750-1035	1530-900	3300-2585
Set	...	...	...	0.12-0.15	0.10-0.07	0.13-0.14	...	0.15-0.14	0.08-0.07	0.12-0.13	0.15-0.13
Stretch	...	...	...	7.7-7.7	6.9-7.1	6.2-6.3	...	6.5-5.8	6.8-6.2	7.8-7.4	6.2-5.6
Minutes of cure	...	...	...	...	120	75	...	40	30	30	90
Tensile	...	...	...	...	2065-815	1190-900	...	860-405	765-403	1685-980	3140-2637
Set	...	...	...	...	0.09-0.06	0.14-0.16	...	0.1-0.09	0.08-0.06	0.13-0.14	0.13-0.13
Stretch	...	...	...	...	8.0-7.0	6.3-5.8	...	5.1-3.0	5.4-4.4	7.7-7.3	5.0-5.0
Minutes of cure	...	...	...	...	160	...	...	60	...	...	...
Tensile	...	...	...	...	1510-1065	...	...	520-475	...	...	...
Set	...	...	...	...	0.10-0.08	...	...	0.06-0.04	...	...	...
Stretch	...	...	...	...	7.4-7.2	...	...	3.8-3.7	...	...	...
Minutes of cure	...	...	...	...	120	...	...	...	...	...	...
Tensile	...	...	...	...	1460-900	...	...	...	...	...	...
Set	...	...	...	...	0.08-0.07	...	...	...	...	...	...
Stretch	...	...	...	...	7.5-7.3	...	...	...	...	...	...

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61. Badly overcured in 105 minutes at 141° C.
62. Badly overcured in 90 minutes at 141° C.
64. Badly overcured in 40 minutes at 141° C.

rashes, erythema, itching, and other symptoms, such as irritation of the mucous membrane of the eyeball.)

These, however, quickly yielded to treatment. As a rule we rubbed the affected parts several times a day with a 0.5-1.0 per cent solution of potassium permanganate. All the symptoms of TNB poisoning disappeared quickly and completely. After we had put into practice the method of carefully preparing on the mill a master batch of rubber and TNB, and using this as the vulcanizing agent in the place of pure TNB, we never had any more cases of TNB poisoning either among the chemists or the workmen.

Advantages of Using 1.3.5 Trinitrobenzene

1. Vulcanizates cured with 1.3.5. trinitrobenzene (TNB) do not age so rapidly as those cured with sulphur. They are considerably more durable in use as well as when stored. Their homogeneity is far greater. We still have a sample of a TNB vulcanizate made in Moscow in 1916. This sample has remained unchanged for thirteen years and its constants appear to be like those of the fresh vulcanizate. No solid surface either of a brittle or tacky character has been formed.

2. TNB promotes more rapid vulcanization.

Table I—Continued

Experiment No.	67	68	69	70	71	72	73*	74	75	76	77
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100	8.1-6.1
1.3.5. Trinitrobenzene	2	2	2	2	2	2	2	2	2	2	100
Aniline	1	1	1	1	1	0	1	1	1	1	2
Zinc oxide (Kadox)	100	50	100	100	50	100	20	20	40	...	1
Litharge	...	...	20	50	...	...	...	20	...	30	...
Carbon black	10	20	...	...	...	...	22	20	50	...	30
Chromic oxide	...	...	...	...	...	...	...	...	...	30	...
Stannic sulphide	...	...	...	...	...	...	...	...	...	...	...
Kieselguhr	...	...	...	...	100	40	20	20	50	...	50
Colophony	...	...	...	...	...	...	...	...	10	...	...
Minutes of cure	30	30	15	10	60	35	30	10	60	5	...
Tensile	2715-2220	2710-1376	2805-2075	2945-2385	2225-2425	2855-2455	1015-835	2395-2250	1860-1385	1795-1105	10
Set	0.13-0.11	0.1-0.07	0.13-0.12	0.18-0.14	0.43-0.26	0.29-0.24	0.12-0.09	0.19-0.16	0.28-0.3	0.09-0.11	1390-730
Stretch	6.6-6.3	6.3-5.2	6.3-6.1	6.3-6.3	5.1-4.7	6.2-5.8	5.0-5.2	5.7-5.6	5.2-5.3	7.5-7.1	0.13-0.11
Minutes of cure	45	45	30	15	75	60	60	15	90	10	7.9-6.4
Tensile	3190-2230	2715-1187	2905-2005	2995-2330	2575-2375	3115-2300	2775-...	3125-2415	2030-1500	1865-1055	15
Set	0.16-0.2	0.09-0.05	0.13-0.1	0.15-0.13	0.39-0.3	0.30-0.24	0.14-...	0.2-0.18	0.29-0.29	0.11-0.08	1295-820
Stretch	6.9-5.9	5.9-4.8	6.3-5.9	6.3-5.7	5.0-4.6	6.0-5.0	6.2-...	6.0-5.4	5.0-5.2	7.4-6.6	0.09-0.11
Minutes of cure	60	60	45	25	90	75	90-...	30	105	25	7.6-6.5
Tensile	2405-2175	2845-1940	2760-2300	2350-2310	2530-2285	3055-2695	3250-2485	2895-2310	2080-1745	1270-1205	30
Set	0.13-0.18	0.11-0.09	0.1-0.09	0.12-0.14	0.37-0.29	0.28-0.2	0.11-0.14	0.2-0.15	0.26-0.24	0.06-0.08	1334-865
Stretch	5.9-5.8	6.3-6.1	5.4-5.8	5.7-5.6	4.4-4.3	5.9-5.5	5.6-5.6	5.4-5.1	5.3-5.0	6.3-6.4	0.12-0.10
Minutes of cure	75	75	...	35	105	90	...	...	...	40	7.4-6.2
Tensile	2890-2355	3020-1955	...	2320-2095	2610-2360	3095-2645	...	...	...	1640-675	45
Set	0.15-0.09	0.17-0.11	...	0.11-0.12	0.42-0.29	0.29-0.26	...	...	...	0.08-0.05	960-755
Stretch	6.6-5.9	6.8-5.1	...	5.1-5.2	5.3-4.3	6.0-5.7	...	...	...	6.8-5.9	0.14-0.08
Minutes of cure	...	90	...	...	...	105	...	...	...	...	...
Tensile	...	2405-1640	...	...	...	3125-2450	...	...	...	...	...
Set	...	0.12-0.08	...	...	...	0.3-0.25	...	...	...	...	...
Stretch	...	5.7-5.2	...	...	...	5.7-5.6	...	...	...	...	...
Minutes of cure	...	105	...	...	...	...	...	...	...	...	...
Tensile	...	2430-1425	...	...	...	...	...	...	...	...	...
Set	...	0.09-0.05	...	...	...	...	...	...	...	...	...
Stretch	...	5.8-5.2	...	...	...	...	...	...	...	...	...

73. All tests made of this stock on a 90-minute cure, including flexing test and abrasion in unit time, etc., were almost the same as those of the sulphur containing sample of black tire tread. The vulcanizate is a little softer and under a blow shows proportionally greater elastic property. For this reason a black tread was made from it.

3. Certain compounds with TNB vulcanize perfectly at ordinary temperature, that is, at 50° or 100°C.

4. Vulcanization with TNB facilitates the introduction into the rubber mixture of various substances, which, if treated with sulphur, would decompose such, for instance as many organic dyestuffs, leather waste, ground sawdust, woodflour, etc.

5. The different compounds of rubber and TNB are proof against over-vulcanization. A mixture of 100 rubber, 150 zinc oxide, 2 TNB, and 1 aniline, after vulcanization lasting 20 minutes at 141°C. (40 pounds), displays almost the same constants (tensile, set, stretch) as after vulcanization lasting 120 minutes at 141°C., thus showing that no noticeable over-vulcanization has occurred even when the time of cure has been six times longer. The same conditions prevail when using admixtures of kieselguhr, carbon black, etc.

6. When vulcanizing rubber with TNB, various new filling agents, such as carborundum and silicon, may be included in the mixing. They act as good accelerators on the one hand, and on the other, they often produce most interesting new physical characteristics in the vulcanizate.

7. Vulcanizates treated with TNB frequently show better physical characteristics, such as: elasticity under pressure (measured by the height of rebound of a metal ball), tensile, and set, which are superior to those of sulphur-cured products.

8. The surface of rubber vulcanized with TNB under the requisite conditions stays without any visible change, when stored, for a very considerable time. For example, it retains its gloss and color unchanged and in a uniform condition. On the contrary, the majority of rubbers vulcanized with sulphur begin rather speedily to liberate this sulphur either in the form of spots or crystals on the surface, or more often in the form of a fine dust or bloom which covers the whole article.

9. Rubber vulcanized with TNB displays greater resistance to acids and is less apt to decompose after being in contact with metals, copper for example, for a considerable time, than is sulphur-cured rubber.

Accelerating Vulcanization with TNB

To accelerate vulcanization with TNB the following materials are required:

1. Metallic oxides and metallic sulphides (also compounds of metals with the elements of the oxygen groups O,S,Se,Te.). For example a mixture of 100 rubber, 150 zinc oxide, and 2 TNB is vulcanized perfectly in 25 minutes at 40 pounds' steam pressure.

2. Elements of the carbon group (carbon black, lampblack, amorphous carbon, graphite, silicon) as well as compounds of these elements with each other, for example carborundum (SiC). A similar action is shown by compounds, such as red phosphorus, powdered aluminum. talcum, ultramarine, mineral flour, etc.

The amorphous modifications of boron which, similar to amorphous carbon, readily absorb the different gases, do not accelerate vulcanization with TNB. Consequently, the action of this material, as contrasted with that of carbon, bears no relation to the gas-absorbing property of the latter.

An experiment specially conducted showed that carbon black, whether ordinary or saturated with air, accelerates vulcanization with TNB equally and to the same extent. From this we gather that in no instance do these accelerators serve as oxygen carriers.

Mixed Accelerators

The accelerators of the first and second groups named above apparently function differently from each other. A mixture of these accelerator groups always works more strongly than either of them by itself. See Table II. The total effect is always the sum of the separate effects. Evidently, the first group embraces the chemical and the second the physical accelerators. The action of these accelerators of vulcanization with TNB differs altogether from that of all known accelerators that have been used in vulcanization with sulphur. The effect, however, is alike in both cases. Certain compounds, for instance those containing kieselguhr or carbon black, carborundum, etc., while accelerating vulcanization, tend at the same time to improve the physical constants of the vulcanizate.

Table II.—Vulcanization of Rubber with 1.3.5. Trinitrobenzene Without Sulphur, Activity of Special Accelerators

Experiment No.	1*	2*	3	4	5	6	7*	8	9	10	11*
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100	100
1.3.5. Trinitrobenzene	2	2	2	2	2	2	2	2	2	2	2
Aniline	1	0	1	1	1	1	1	1	1	1	1
Carbon black	...	...	10	100	...	...	100	...	...	...	...
Litharge	...	...	...	...	30	100	30	...	20	...	...
Zinc oxide (Kadox)	...	...	...	...	...	...	...	150	100	...	...
Chromic oxide	...	...	...	...	...	...	...	...	...	...	50
Magnesium oxide	...	...	...	...	...	...	...	...	...	175	...
Minutes at 141° C. for full cure.	No cure	No cure	90	30	30	5	5	20	15	5	60

*

1 and 2. In these stocks only the traces of vulcanization are noticeable in 180 minutes at 141° C. The product being like raw rubber, it can be easily milled, sticks together, and in time shows on its surface a delicate green deposit of a nitroso compound by Liebermann's reaction.
7. This stock also vulcanizes at room temperature.
11. This product is a beautiful green, possesses a good stretch and very low set. It is too weak and easily torn. It has a brilliant surface. In time it slowly develops tackiness.

Experiment No.	12*	13	14	15	16	17	18	19	20	21*	22*
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100	100
1.3.5. Trinitrobenzene	2	2	2	2	2	2	2	2	2	2	2
Aniline	1	1	1	0	0	1	1	1	1	1	1
Carborundum	...	...	...	...	...	...	...	...	...	180	100
Kieselguhr	...	...	...	...	...	100	60	...	...	...	...
Silicon	...	...	...	...	...	...	...	...	30	...	...
Litharge	...	...	...	...	...	...	10	30	30	...	...
Titanium dioxide	108	...	...	...	...	...	...	...	...	...	...
Calcium sulphide	...	...	...	...	100	...	...	...	...	...	...
Cadmium sulphide	...	...	75	75	...	...	...	...	...	...	...
Lead sulphide	...	60	...	...	...	...	...	...	...	...	...
Minutes at 141° C. for full cure.	No cure	25	180	15	30	90	5	5+	5	5+	60

*

12. This mix begins to cure in 105 minutes but its complete vulcanization requires 180 minutes. The cured product is somewhat tacky, weak, and easily deformed under mechanical treatment.
21. This stock overcures badly in 5 minutes. The product is a beautiful brown. A very brittle vulcanizate is produced in 30 minutes or more of heating at 141° C. The stock should be cured at about 125° C.
22 and 23. Upon prolonged keeping these vulcanizates show a greenish surface deposit. Hence it follows that acceleration of vulcanization by carborundum does not depend upon the amount of 1.3.5. trinitrobenzene used.

Experiment No.	23*	24*	25*	26	27	28*	29*	30*	31*	32*	32A*
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100	100
1.3.5. Trinitrobenzene	5	2	2	2	2	2	2	2	2	2	2
Aniline	1	1	1	1	1	1	1	0	0	1	1
Carborundum	100	...	...	...	...	100	50	...	...	100	130
Graphite	...	...	...	...	100	...	...	...	...	...	...
Talc	...	75	...	...	...	...	...	...	...	...	...
Aluminum powder	...	...	150	100	...	...	...	...	...	...	...
Ultramarine	...	...	...	...	...	...	...	75	...	...	...
Litharge	...	...	...	30	...	30	30	...	...	30	30
Boron, amorphous	...	...	...	...	...	...	...	...	100	...	...
Minutes at 141° C. for full cure.	60	180	105	5 to 10	45 to 60	5	5	105	90	5	5

*

24. Vulcanization is near completion in 90 minutes. The product is bright brown, somewhat resembling old leather. The set of the stock is very low and it can be torn with comparative ease.
25. This product is naturally leather-like.
28 and 29. Very good products. The carborundum must be used in very finely powdered condition.
30. This product is porous and on this account can be easily torn. Its surface is black but when cut it is clear blue.
31. When completely cured, this product appears to be hygroscopic. It is brownish red and smells disagreeably of phosphoric hydrides.
32 and 32A. Badly overcures in 10 minutes.

Experiment No.	33*	34	35*	36*	37	38*	39	40	41	42
Rubber, pale crepe	100	100	100	100	100	100	100	100	100	100
1.3.5. Trinitrobenzene	2	2	2	2	2	2	2	2	2	2
Aniline	1	1	...	0	0	0	...	1	0	0
Aluminum oxide	...	...	30	...	...	...	...	...	...	...
Talc	30	...	...	...	...	...	...	...	...	...
Silica	...	100	...	...	...	...	...	...	...	...
Kieselguhr	...	...	...	...	...	...	...	30	...	...
Litharge	30	...	30	...	...	...	30	30	...	30
Cadmium sulphide	...	...	...	70	140	70	...	...	...	...
Chromic oxide	...	...	...	...	...	...	30	...	100	50
Minutes at 141° C. for full cure.	10	90	10	No cure	No cure	110	5	5	160	5

*

33. Badly overcures in 25 minutes.
35. A very good product. In order to make clear the acceleration of vulcanization by aluminum oxide refer to Experiment 5 of Table II.
36. This shows no trace of vulcanization in 180 minutes at 141° C.
38. Shows no cure in 60 minutes. This mix without boron is completely cured in 30 minutes.

Speed of Vulcanization

Moreover, it has been found that the speed of vulcanization with TNB in the presence of zinc oxide depends largely upon the nature of the latter substance. Thus, a mixture of 100 rubber, 2 TNB, and 150 Kadox zinc oxide is completely vulcanized in 20 to 25 minutes, at 40 pounds, 141°C., whereas the same mixture, but with ordinary zinc oxide, requires under the same conditions 160 minutes, for complete vulcanization. Thus, vulcanization with TNB in the presence of Kadox zinc oxide takes place at a speed approximately six times greater than vulcanization with ordinary zinc oxide. Our observations show that Kadox in contradistinction to ordinary zinc oxide readily decolorizes aqueous solutions of methylene blue and of many other dyestuffs. Moreover, Kadox is distinguished from all other zinc oxides in that it contains a small amount of free zinc in the form of zinc dust, traces of germanium, etc.

Whether used with TNB or any other nitro-compound, the accelerators of TNB vulcanization react on the whole in the same way. A mixture of, say 100 gms. of rubber, 3 gms. of meta-dinitrobenzene, and 150 zinc oxide will not vulcanize to any appreciable extent even though heated for two hours at 141°C. However, upon the addition of about 20 gms. of carbon black, the new mixture will vulcanize completely within 20 minutes. As a rule, meta-dinitro-benzene vulcanizes rubber much more slowly than TNB does.

Minimum Amount of TNB Required for Complete Vulcanization

The powerful accelerators in TNB vulcanization, as well as the accelerators in sulphur vulcanization, allow us to determine the exact minimum quantity of the vulcanizing agent required. By using a mixture of litharge and carbon black, we found that the minimum amount of TNB required for complete vulcanization of rubber lies between 0.25 and 0.5 per cent. For example, a mixture of 100 rubber, 0.25 TNB, and 30 litharge, plus 100 carbon black vulcanizes completely in 105 to 120 minutes at a pressure of 40 pounds, 141°C., whereas a mixture of 100 rubber, 0.5 TNB, and 30 lead oxide, plus 100 carbon black vulcanizes completely in 30 minutes under the same conditions. The latter mixture produces a leathery vulcanizate of the following average constants: tensile, 1,590; set, 0.12; and stretch, 3.1. Therefore it shows that 0.5 per cent of TNB promotes complete vulcanization.

General Considerations

1. The time required for TNB vulcanization remains the same in the presence of organic peroxides (0.5 to 3.0 per cent), whether TNB itself or any other nitro-compound is used.
2. The presence of sulphur (0.3 to 8.0 per cent) or of ordinary accelerators (amine or amine plus carbon bisulphide) does not affect the speed of vulcanization with TNB.
3. If the amount of sulphur is increased (2 to 8 per cent), or a large quantity of aliphatic or aromatic amines be used, the vulcanization process with nitro-compounds will be retarded and the physical constants of the vulcanizate will be impaired.
4. Aromatic amines, sulphur, metallic sulphides, and especially antimony pentasulphide, some of the sulphur dyes, and tannic acid protect the TNB vulcanizates from oxidation and other chemical changes when stored in the open air. These substances should, however, be used only in certain and very minute quantities (0.3 to 1.0 per cent.)

Practical Use of TNB as a Vulcanizing Agent

The following stocks were vulcanized with TNB: stock for driving belts, for solid tires, a mixture of rubber and cement, and several leather-like vulcanizates. When tested, all these vulcanizates proved to be superior to those cured with sulphur.

Therefore we come to the conclusion that:

1. Belting vulcanized with TNB is twice as durable as belting made of a stock vulcanized with sulphur.
2. Leather-like products made of a mixture of rubber, TNB, and carbon black have a beautiful and glossy black coloring. They show no bloom and display higher tensile, while their set and stretch are but slight.
3. Solid tires vulcanized with TNB retain their homogeneity longer and show better resistance to wear than sulphur-vulcanized tires. They are also far more durable in use.

Tests of hardness, abrasion, and elasticity under pressure were performed in the laboratories under ordinary conditions. When compared with tests on rubbers cured with sulphur under the same conditions, showing the same constants and with the same general appearance, the TNB-cured products gave results which were not only equal to but practically in many cases much more valuable than those of sulphur-cured stocks.

Acknowledgment

The work described in this article was performed in the General Laboratories of the United States Rubber Co., New York, N. Y. I take this opportunity to acknowledge to Ernest Hopkinson and to A. E. Jury my appreciation for the interest which they invariably showed in the work and for the arrangements they made for conducting these researches.

Golden Jubilee of Light

The international celebration of the golden jubilee of light—marking the fiftieth anniversary of the invention of the incandescent light bulb by Thomas Edison—was inaugurated in Atlantic City, N. J., on the evening of May 31. In addition to opening the world-wide festival of light, the event initiated a brilliant light display throughout the entire resort and approaching highways to last until October 21, the anniversary date. The members of the general committee announced to date are: Herbert Hoover, honorary chairman, General Robert Lee Bullard, Newcomb Carlton, Paul D. Cravath, John W. Davis, Harvey Firestone, Henry Ford, James W. Gerard, Clarence Mackay, Andrew Mellon, John D. Rockefeller, Jr., and Charles M. Schwab.

The celebration will have its climax in a great festival of light throughout the United States on October 21, and a testimonial dinner to be given to the inventor by Henry Ford at Dearborn, to be attended by America's most distinguished men. This will also be the occasion of the dedication at Dearborn of the completely restored Edison's Menlo Park laboratories and other buildings from Menlo Park, which will permanently preserve for the people a record of the life and inventions of Mr. Edison.

May 31 also marked the beginning of an official celebration of Atlantic City's diamond anniversary as a duly incorporated community, as well as the formal opening of the Atlantic City Auditorium, the largest convention hall in the world.

Automobiles and Rubber

The total output of automobiles, both passenger cars and trucks, amounting to more than 4,350,000 units, during 1928 was the largest production ever recorded. The production of automobiles in Canada was likewise greater in 1928 than in any other previous year.

Exports of automobiles from the United States showed a gain of over 30 per cent over the preceding year. The output of pneumatic tires during November, 1928, though showing a decline from October, was substantially greater than in November, 1927. For the first 11 months of 1928 domestic shipments of pneumatic tires were almost 20 per cent larger than in the same period of 1927. Shipments of inner tubes during the same period showed a gain of 8 per cent over the same period of 1927. Imports of crude rubber in December were considerably greater than in the previous month or December, 1927. Stocks of crude rubber in the United States at the end of the year were considerably smaller than at the end of 1927.

Stamping Designs on Rubber

A simple pigment for applying designs on rubberware is a paste composed of 25 parts of zinc oxide with a rubber cement made with 5 parts of crepe in 50 parts of benzol. Many opaque colors can be obtained by adding a small amount of organic dyes, especially those of the stearate type.

Automatic Traffic Control Makes Use of Rubber

A SUPERHUMAN traffic-dispatching control which regulates traffic more efficiently than the most intelligent traffic officer has recently been introduced to the traffic world. To fulfill the claims made by the inventors, the device necessarily had to possess a brain comparable to that of a human being. It seemed highly improbable that any mechanism could be devised which could think. When the system was installed in eastern states, it, however, proved capable of accomplishing the claims of its inventors and demonstrated that it possesses mechanical intelligence of a high order.

The Electro-Matic system is vehicle-actuated and the vehicles themselves govern the changing of the signal lights. There are two units in the apparatus which may be likened to the "eyes" and "brain" of a traffic officer, but there the resemblance ceases, for the mechanical "eyes" and "brain" are not subject to fatigue and operate with maximum efficiency at all times.

Pavement units are the "eyes" of the apparatus. These units are "pressure-sensitive" contacts set into the pavement on all approaches adjacent to the intersection. A number of materials were used during the experimental stage for covering these units, and rubber was found to be best because of its resiliency, long durability, and perfect protection afforded against rain, snow, and ice. Approximately eight strips of rubber eight feet long and nearly one inch thick are used in each installation. There is no motion of the units as cars pass over them. They operate by pressure only. Vehicles do not stop at these units, nor are the drivers aware of their presence. They serve merely to indicate the presence and movement of the car and transmit this indication to a control mechanism.

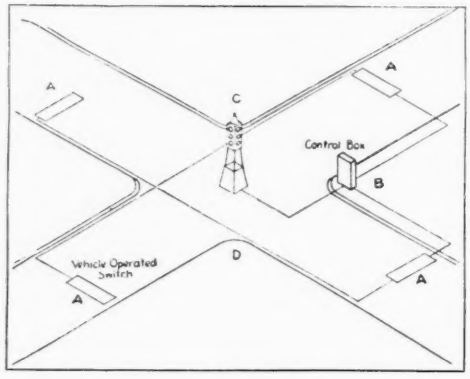


Diagram Showing Rubber Pavement Units and Principle of Car-Thrown Signals

Downtown Area of Wilmington, Del., Controlled by a Completely Coordinated System of Electro-Matic

The control unit receives this impulse, records the presence of the vehicle, and schedules it through the intersection. If there is no cross traffic at the time, the right-of-way is given to the vehicle immediately, but in the event there is traffic, the control remembers the waiting car and when a break occurs, the control, like a policeman, gives the green light to that car, indicating that the crossing is clear. Continuous traffic on a major thoroughfare is never interrupted unless a vehicle actually wishes to cross, and even then traffic is stopped for just a sufficient length of time to allow whatever opposing traffic there is to cross. No car is forced to wait against opposing traffic for more than a set maximum time, which is very flexible and can be regulated from the control box at will.

Waiting against the red light is impossible if there is no opposing traffic, for the control will give the green light instantly to the approaching vehicle. The system has eliminated the needless delay that would ordinarily result if the signals were fixed or arbitrarily timed. The control is flexible and takes traffic through the intersection in accordance with its actual flow.

There are innumerable systems to which this device can be adapted which allow it to meet every requirement. Electro-Matic systems have been installed and have solved successfully the traffic problems of X-shaped intersections with fast left-hand turns, T-shaped intersections, highspeed arterial highways, and complex five-point intersections. In congested downtown city areas, the installation of this system under coordinated control has resulted in a marked relief in congestion and a much faster movement of traffic.

Says Latex Improves Violin Wood

THAT the sonority of violin wood may be enhanced and the wood made permanently elastic by treating it with rubber latex before varnishing is claimed by Ditmar-Graz in the German *Natur und Kultur*. The same advantage was claimed several years ago by a German investigator using crude rubber in a benzol solution. An expert German violin maker, who has repaired numerous "old masters," when interviewed by a representative of INDIA RUBBER WORLD, while conceding the possibility of benefiting violin material with rubber impregnation, expressed doubt of its practical value; nor did he credit a theory current some time ago that the rare quality possessed by some famous old makes was due to solutioning the wood with rubber. Certain it is that when the fine Amati, Stradivari, and Guarnieri violins were being made in the 16th and 17th centuries, Europeans did not appear to be familiar with either latex or rubber.

The U.S. Navy's Rubber "Lung"

The Newest Development for Submarine Escape

F. M. HOBSON[1]

The Rubber "Lung"

THE versatility of rubber has again been demonstrated by the United States Navy's latest development—a submarine escape device known as the "Lung."

Since the advent of the submarine, the possibility of devising a practical means of insuring the safety of the crews in case of accident, without detriment to the military efficiency of the vessels, has been made the subject of extensive research by practically all maritime nations. The United States Navy has been particularly active in this connection and it is probable that the extent and scope of its experimental and research work along these and allied lines has been greater than those of any nation to date. Its earliest efforts were begun in 1912 and continued intermittently, as conditions permitted, to the present time. That its efforts have not been fruitless is evidenced by (1) improved diving apparatus and methods which have enabled Navy divers to descend to world-record depths of 306 feet with the possibility of attaining, in emergencies, even greater depths, and (2) the development of the "Lung." In Navy equipment of this general character the majority of the parts are made of rubber. The characteristics and adaptability of this material has contributed largely to the present perfection of Navy apparatus and to the solution of what has proved to be a difficult problem—a satisfactory means of affording individual escape from disabled sunken submarines.

The problem of devising means whereby the rescue of the crew of a disabled sunken submarine may be safely effected may be resolved into two phases, first, individual escape and second, collective rescue. Heretofore, a practical apparatus for individual escape not having been devised, the raising of a vessel by means of pontoons has necessarily had to be relied upon for collective rescue. Experience has shown that this process requires considerable time.

The contingencies of collective rescue have emphasized the necessity of devising a means of individual escape. The efforts of foreign nations, in this connection, have resulted in the commercial development of two types of submarine escape apparatus. One is a helmet-type apparatus and the other a self-contained combination life-jacket and breathing-bag type. Neither of these apparatus appear to have found favor of submarine personnel even of the countries in which they were perfected.

Any individual devices installed for submarine escape should be sufficiently numerous to provide one for each member of the crew irrespective of the location of the compartments to which they may have to retreat in case of emergency. The reserve buoyancy of submarines is small. Necessarily any devices of this nature have to be small, compact, and of light weight if they are to be carried aboard in the required quantities. Other essential requirements are: (1) that its principle of operation be simple and possible under all conditions that may be encountered; (2) that it requires a minimum of training on the part of the men; (3) that it permits normal respiration under all of the varying conditions encountered by maintaining the air within the apparatus and the wearer's body and the external water pressure all in proper equilibrium; (4) that it affords a means whereby the wearer, after reaching the surface, can remain afloat without swimming; and (5) that its principle of operation be such as to permit the wearer to regulate his ascent to conform with that required for proper decompression.

The latter requirement has always constituted a particularly difficult problem not only in the development of this particular device but in general diving work. The nitrogen in high-pressure air, when breathed by human beings, is taken up by the blood and tissues in solution. When the pressure is suddenly reduced, such as occurs when a man quickly ascends from a deep depth, this nitrogen is liberated from the blood and tissues in the form of bubbles which collect around the lesions and muscles and cause what is commonly known as "bends." Contraction is prevented by gradual desaturation or decompression, usually accomplished by stopping at certain stages for certain periods during ascent.

All efforts to modify existing types of submarine escape apparatus to conform to the above requirements proved unavailing. Accordingly it was decided to abandon them. By study of the conditions attendant on the sinking of submarines and deductions from extensive data obtained from experiments in diving work conducted over a number of years by Chief Gunner C. L. Tibbals, U.S.N., development of a practical means of individual escape was started.

Equipment made available for this purpose consisted principally of the sixty-foot mine tank at the Washington Navy Yard; a high-pressure water-tank, Figure 1; a high-pressure

[1]Bureau of Construction and Repair, Navy Department, Washington, D. C.

decompression chamber, Figure 2, and miscellaneous diving bells and standard diving equipment. The high-pressure water-tank is a steel cylindrical tank with a three-foot manhole in the top. When in operation, the tank is filled with water to within about a foot of the top and air pressure applied. It is capable of withstanding a working pressure of 150 pounds per square inch, thus simulating pressure conditions at sea depths up to approximately 300 feet. The tank is provided with glass port-holes through which the actions of the occupants can be properly observed.

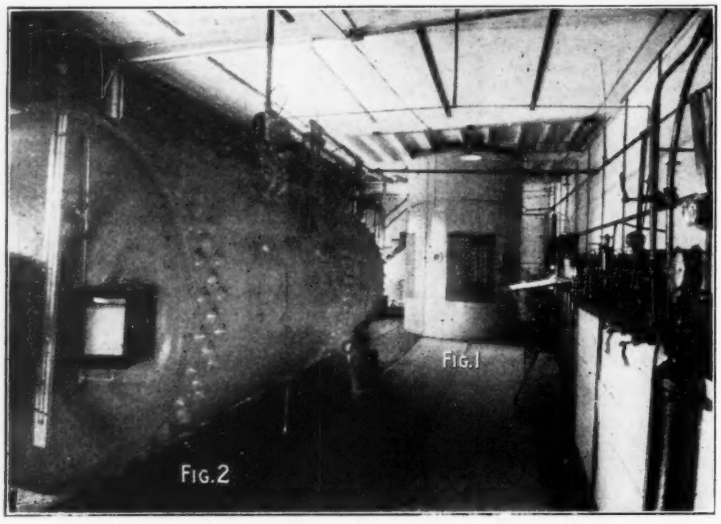


Fig. 2. Decompression Chamber **Fig. 1. Water Pressure Tank**

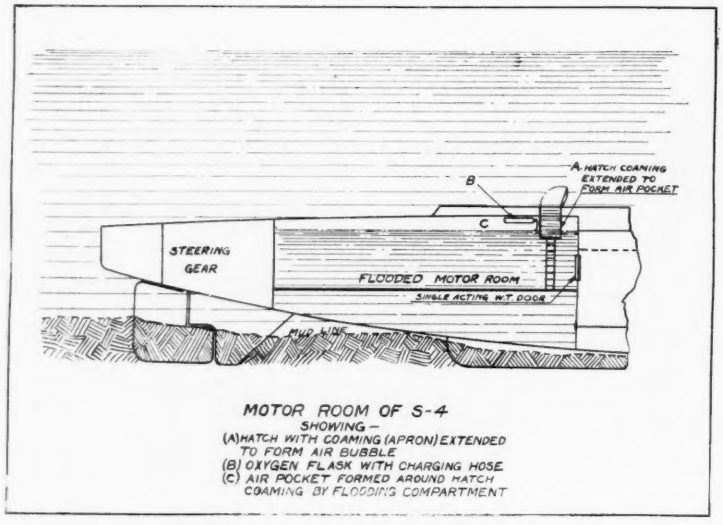
The decompression chamber shown in Figure 2 consists of a steel tank divided into two compartments with cast heads and doors. Only one of the compartments is normally occupied during experimental work. The other compartment is necessary, however, to permit entrance of outside attendants in case of emergency to the other compartment without reducing the air pressure in the latter. The chamber is constructed to stand 500 pounds per square inch internal air pressure. This, too, is provided with glass ports through which the occupants may be observed by outside attendants. The decompression chamber and water-tank doors are maintained airtight by rubber gaskets, which seat airtight on beaded flanges when the doors are under internal pressure.

The Bureau of Construction and Repair, after developing, testing, and modifying numerous types of devices, finally evolved the "Lung." Exhaustive tests have proved that it satisfactorily complies with all of the requirements mentioned in the foregoing. The device is shown on the title page and consists of: (1) a rubber breathing bag, the capacity of which when inflated is approximately equal to the air capacity of the lungs, bronchial tracts, etc.; (2) two special molded twin corrugated rubber breathing tubes attached to the breathing bag and to a metal mouthpiece; (3) a metal mouthpiece containing metal partitions and mica disk flapper valves which control the directional flow of inhaled and exhaled air and containing also a metal cut-off valve, the closing of which prevents the entrance of air to the apparatus when the same is not in use; (4) a metal canister containing soda lime for absorption of CO_2; (5) a vent valve which automatically maintains uniform inflation of the bag irrespective of the surrounding pressures, thereby maintaining a proper equilibrium between internal and external pressures and a uniform displacement or buoyancy; (6) a rubber mouthpiece permitting the flow of inhaled and exhaled air to and from the body; and (7) shoulder and waist straps and trouser clamps. The apparatus in its present form, weighs slightly over two pounds. It is probable that with contemplated refinements even this weight can be somewhat reduced.

Aside from its compactness and small weight, the apparatus differs from any hitherto designed for this purpose, by virtue of its principle of operation. In all other apparatus constructed to date, the necessity of insuring an adequate supply of respirable atmosphere to the wearer at all times has led to the incorporation of self-contained units consisting usually of relatively large and heavy flasks containing compressed air or oxygen, forming integral parts of the apparatus, resulting not only in prohibitive weight but in many inherent disadvantages too numerous to mention.

In lieu of depending upon such extraneous and unreliable sources of respirable atmosphere, this new apparatus is designed primarily to continuously utilize the air compressed within the wearer's body as it is released by the lungs when subjected to the decreasing external pressures attendant on his ascent. Because of the apparatus having the functions of a third lung, as it were, it was given the name of the "Lung." This name, being monosyllabic, lends itself well for quickly conveying to the minds of the crew of a sunken submarine that they are to equip themselves with the apparatus and be prepared for individual escape.

The normal average capacity of the lungs and bronchial tracts is 500 c.c. for free air at atmospheric pressure. In a disabled sunken submarine, for example, at 165 feet, the gage pressure of the air bubble formed by flooding a compartment or an escape lock preparatory to the crew's emergence would be approximately 73½ pounds per square inch. The air within the occupants' lungs would also be at a pressure of 73½ pounds per square inch, or five times atmospheric pressure, the volume being equivalent to approximately five times the volume contained therein at atmospheric pressure. Under



MOTOR ROOM OF S-4
SHOWING—
(A) HATCH WITH COAMING (APRON) EXTENDED TO FORM AIR BUBBLE
(B) OXYGEN FLASK WITH CHARGING HOSE
(C) AIR POCKET FORMED AROUND HATCH COAMING BY FLOODING COMPARTMENT

Fig. 3. Motor Room of U. S. Submarine S-4

such conditions the lungs and air tracts of the human body may be considered as a reservoir which tests have proved to contain the amount of air which is more than sufficient to fill ordinary respiratory requirements of individuals during their ascent, provided such air is properly regulated and purified before reinhalation. The "Lung" is designed to use as large a portion of this air as is consistent with the maintenance of equilibrium between internal and external pressures during a man's ascent. As an additional reserve and to insure that the air rebreathed by the wearer contains sufficient oxygen, the apparatus contemplates the initial inflation of the breathing bag with oxygen prior to the man's emergence.

The proper method of use of the apparatus, its functions, and the proposed method of individual escape from the submarines are as follows: The apparatus is supplemented by a buoy line attached to a small buoy of the size now carried aboard submarines. The line is equipped with small cork markers or "stops" spaced ten feet apart. This line will be carried aboard the submarine and located within the escape lock or immediately adjacent to escape hatches. Two "Lungs" will be provided for each member of the crew, the total number being equally divided between the forward and after compartments. In case of disability to the vessel, the crew will make its way to either the forward or after compartment or both, depending on the location of the damage.

Figure 3 represents the motor room of a submarine. The room is provided with a single acting watertight door and an overhead hatch *A*. A coaming or skirt extends below this hatch into the motor room for a distance of from two to three feet. A standard oxygen flask, *B*, equipped with a standard reducing valve and discharge hose fitted with an automobile tire air chuck, is installed immediately adjacent to the escape hatch. The "Lungs" are likewise stowed in overhead racks adjacent to the escape hatch. The room is provided with a standard flooding and venting system. In emergencies requiring the escape of the crew while submerged, the men enter this compartment closing behind them the watertight door. Each man dons a "Lung." This is done by clamping the belt around the waist and snapping the lower clamps to the clothing in such a position that when standing erect and with the head erect, the mouthpiece will be on the level with the wearer's mouth. The flood valves of the room are then opened, and outside sea water begins to flood the room. As this flooding continues, there is built up in the upper part of the room an air pressure which eventually becomes equal to the pressure of the outside water. At this stage flooding automatically ceases leaving a permanent air bubble, surrounding the hatch coaming *A* of Figure 3.

Fig. 5. Releasing Buoy Line from Escape Lock

Fig. 6. Emerging from Hatch with "Lung" Attached

Fig. 4. Lt. Shugg, U. S. N., Inflating Rubber "Lung" in Flooded Motor Room of U. S. Submarine S-4

When the pressure within and without the room is equalized, the hatch cover automatically opens or can be opened with slight hand pressure. When it opens, additional water, of course, rushes in filling the hatch coaming but does not affect the air bubble surrounding the coaming. The men stand with their heads in this air bubble. When flooding ceases, the men insert the mouthpiece of the "Lung" in the mouth, open the cut-off valve in the mouthpiece, and seal the nostrils with the nose clip forming a part of the device. See Figure 4. The breathing bag is then inflated from the oxygen bottle overhead. The breathing bag is inflated by pressing the air chuck of the oxygen-flask hose momentarily over the inlet valve on the apparatus. At deep depths the bag has to be inflated only once prior to the man's emergence. In shallow depths it is desirable that the bag be inflated once and inhaled from several times by the wearer in order to wash out his lungs, the bag being then again finally inflated.

When the escape hatch is opened, the cork buoy is released and floats to the surface, the end remaining attached to the submarine. See Figures 5 and 6. The men, after inflating the breathing bag "duck" under the escape hatch coaming, grab the buoy line, pass through the hatch, and wrapping their legs around the line, allow themselves to float without stopping to a predetermined distance, which is easily determined by counting the number of cork markers on the buoy line. After ascending one at a time to the first marker, they remain

at this depth for a certain length of time, which is determined by counting the number of breaths prescribed for that depth. At the end of this time the ascent is continued to the next and to subsequent markers where the same procedure is carried out. By this procedure the proper decompression required for any depth is properly performed by the man himself. The necessary depths at which such stops are made and the length of time (number of breaths) which the man is to stay at such depths have been computed after extensive experiments and will be issued in the form of a table. Upon reaching the surface, the men remove the mouthpiece from the mouth and close the cut-off valve to prevent the entrance of water or air to the soda lime and to maintain the buoyancy of the breathing bag.

When the men emerge from the escape lock or escape hatch, the breathing bag of the apparatus after its initial inflation contains air or oxygen at a pressure of about one-half pound in excess of the pressure of the surrounding water. As the men ascend and the pressure of the surrounding water decreases, the air within the breathing bag, of course, tends to expand. Instead, however, of causing an over-inflation of the bag, with its consequent greater displacement, the excess air escapes from the vent valve on the bottom of the bag, which is so located that it is about twelve inches below the top of the bag or about eighteen inches below the wearer's mouth. In placing the valve in this location, it is, therefore, subjected to an external pressure of from one-half to three-fourths pound in excess of the pressure of the water surrounding the upper part of the bag and the wearer's mouth. Consequently this relief valve will remain closed until the pressure within the bag exceeds the pressure of the water at the level of the valve. This feature maintains a constant displacement and, therefore, constant buoyancy of the apparatus.

Also, in the "Lung" the process usually employed in purifying the exhaled air has been reversed, i.e., the wearer inhales through the soda lime instead of exhaling through it as is the case with commercial apparatus. This process not only insures the absorption of the proper amount of CO_2 in the exhaled air, but resistance to breathing is overcome by utilizing the approximately one-half pound difference in water pressure between the soda lime container and the wearer's mouth to help force the inhaled air through the soda lime container. In maintaining the equilibrium between the pressure within the apparatus and the pressure within the wearer's body and the pressure of the surrounding water at any depth, no difficulty is encountered in retaining the mouthpiece of the apparatus in place.

As mentioned above, the utility of this apparatus contemplates the use of the oxygen line or bottles on board a submarine. However, as an alternative process, a small oxygen bottle contained in a friction pocket on the belt of the apparatus can be used. The bottle would not, however, be an integral part of the apparatus but would be so fitted that it could be used for the initial inflation of the bag and then thrown away at the wearer's option. The bottle may have an added advantage in permitting the apparatus to be used as a protective device for remaining for short periods in toxic atmospheres such as may be encountered in fire fighting or battery troubles on board submarines. However, the use of this bottle would add probably 1½ pounds to the weight of the apparatus and so far as its use for submarine escape is concerned it is questionable whether its benefits would be commensurate with the additional weight.

In connection with the use of oxygen as a reserve supply to the wearers, it should be brought out at this point that until the extensive diving experiments were started several years ago by the Bureau of Construction and Repair, Navy Department, under the supervision of Chief Gunner Tibbals, it was considered unsafe to breathe pure oxygen at over thirty-pounds pressure. Throughout the experiments in the development of the "Lung" it has been further verified that the use of pure oxygen at high pressures for short periods is not detrimental. In the diving experiments referred to and also in the development of this apparatus, pure oxygen has been used without detriment for short periods up to nine atmospheres, or approximately 132 pounds.

The "Lung" has no intricate valves to manipulate and no movable parts that are likely to be damaged aboard a submarine. It can be put on in about five seconds. To date the apparatus has been tested and used with very satisfactory results as follows: (A) Tests at the Washington Navy Yard in the diving pressure water-tank simulating conditions of ascents from submarines in depths of from ten feet up to 301 feet; (B) Ascents from a diving lock constructed to simulate escape locks such as are on "V" class submarines at 110 feet in the Potomac; (C) Similar tests in Chesapeake Bay at 155 feet; (D) Escape from the S-4 at Key West at progressively increasing depths to a maximum of 200 feet.

During the S-4 tests, at one time when that vessel was on bottom at a depth of 76 feet, with 50 feet of water over the escape lock and 56 feet over the motor-room hatch, Chief Gunner Tibbals stepped out of the escape lock, donned a diving helmet previously placed on deck and went aft to the motor-room hatch. He found the motor-room hatch open and entered, removed his diving helmet in the motor-room air pocket, verified the fact that Lieutenant Momsen and Chief Torpedoman Kolinoski who were testing the "Lung" had left for the surface, returned to the deck in helmet, and closed the motor-room hatch. Meanwhile, Seaman Regan, tending the open escape lock, became worried over the long absence of Chief Gunner Tibbals. Making use of his "Lung" he made his way aft on deck, holding himself down along the life lines, and found Chief Gunner Tibbals closing the hatch.

A forty-foot test was conducted at Key West in which various members of the crew escaped from the motor room at between thirty and forty feet to permit the taking of underwater moving pictures for instruction purposes. In addition to members of the crew several outsiders were permitted to participate in this test to indicate the facility with which the apparatus could be used by personnel who had not previously been instructed or trained in its use.

The escape tests on the U. S. Submarine S-4 were made under the supervision of Lieutenant Commander Dunbar, U. S. N. All tests were conducted under conditions attendant on actual emergency, and in each test the men escaping from the various hatches and locks, decompressed themselves on the way to the surface in accordance with the required method of stopping at intervals for certain definite periods in accordance with proper decompression tables devised by the Navy for this purpose. All of these tests were in every way satisfactory and no hardship nor ill effect was felt by any of the participants.

Consumption of Tire Fabric and Hose Duck

The Department of Commerce reports in the biennial census of cotton goods, the following figures relating to rubber fabrics:

	1925	1927
Cord Fabric for Tires		
Pounds	140,492,454	160,612,114
Square yards	176,964,466	179,740,778
Value	$80,478,625	$66,974,970
Tire Duck		
Pounds	32,081,733	30,164,943
Square yards	40,761,508	35,474,346
Value	$16,628,610	$11,343,197
Tire Fabrics Other than Cord or Duck		
Pounds	16,771,008	6,576,001
Square yards	24,400,485	10,716,518
Value	$8,518,659	$2,656,032
Hose and Belting Duck (12 inches and over in width, plied warp and plied filling)		
Pounds	.....	33,019,342
Square yards	.....	19,804,985
Value	.....	$10,791,106

Tire Design

With Relation to

Comfort, Flexibility, and Wear

T. M. KNOWLAND

THIS paper summarizes some of the more important factors in tire design which exert a controlling influence on tire comfort, flexibility, and wear. It is not attempted to add to any of the fundamental principles of tire design already laid down, but it is hoped to give a somewhat clearer insight into some of the simple mechanics and economics of tire behavior. In doing so, acknowledgment should always be made of the important and fundamental work of Schippel[1] and Healy[2], whose investigations have provided an exhaustive research into tire mechanics.

The scope of tire design is so broad that only a very few of the most important phases of it can be treated here. Several hundred specifications enter into the construction and composition of a single tire. Furthermore, the recognized types of tire failures are very considerable in number and may be due to either chemical or mechanical defects, or both. All normal tire failures, however, can be broadly classified as carcass failures, or wear failures, the chemical difficulties being included in both groups.

A perfectly balanced tire, correctly cured, will fail through tread wear, the carcass being designed to last somewhat longer than the tread. Normal carcass failures are due to the bending action or deflection which takes place with every revolution on the road, while tread failures are due in general to the abrasive action of the road.

Pneumatic tires are used on automobiles because they are resilient, and because they can deflect and prevent ordinary obstacles on the road from imparting an instantaneous vertical acceleration to the automobile wheels. This is due to the fact that a tire resembles, to a certain extent, a full elliptic spring. A comparison of the relative rates of deflection of a 6-inch tire and a 40-inch spring is shown in Plate 1. This indicates the relative absorption capacity of a tire at full inflation pressure and at 25 per cent under inflation.

Plate 2 shows what is meant by deflection, by percentage deflection, and by rate of deflection. The comfort of a tire depends largely on its ability to absorb a given obstruction without an instant rebound, and there are two cases to consider. First, when the tire meets an obstruction at high speed, so that the obstruction is completely absorbed by the tire which reacts upward a fraction of a second later. Secondly, when the tire meets the obstacle at slow speed and although deflected, is almost instantly thrown in the air. To determine the impact effect on a tire passing an obstacle at high speed, the tire may be compressed on a plane surface under a normal load and the deflection noted. The obstacle is then placed in a series of positions under the tire, which is additionally loaded so as to maintain the same constant deflection that was present under normal load. The amount of additional loading required is obviously a direct measure of the upward force of the obstacle and is proportional to its height and shape.

The time required in passing the obstacle, multiplied by the average upward force of the obstacle, gives the impulse which is imparted to the wheel and which the automobilist is most anxious to avoid. In carrying out these experiments on different tires, it has been found that the upward reacting force—and therefore the upward impulse—is approximately the same regardless of the load or the tire size, provided the *rate of deflection under static load* is the same in each case.

In other words, the comfort of the tire itself, or its ability to withstand road shocks can be measured by determining its rate of deflection under static load. It further follows that a 30 by 3½-inch, high-pressure tire is substantially as comfortable for an automobile as a 6-inch balloon tire provided its rate of deflection under load is the same, and it can be made approximately the same by suitably regulating the inflation pressures. Of course, the tire life would be enormously decreased.

The effect on the axle of passing obstacles at low speed has been determined with various types of accelerometers and the comfort factor of different tires determined dynamically.

It is quite generally agreed that the disagreeable jarring sensations experienced in automobile riding are not due to the amount of vertical displacement of the wheels nor to the vertical velocity, but to the vertical acceleration. The human body, in other words, is very sensitive to changes in acceleration, and it is possible to accurately measure this discomfort effect by use of a seismograph attached to the axle, which gives the vertical displacements as the axle travels over the obstacle. See Plate 3.

From the vertical displacement (1) can be plotted the vertical velocity (2), which is the slope of the vertical displacement line. The vertical acceleration (3) or degree of discomfort experienced can further be plotted as the slope of the vertical velocity line as indicated. This represents an accurate dynamic method of measuring the comfort of a tire. But it is interesting to note that it has been pointed out by Purdy and Day[3] that tires which have been classified as to comfort by the dynamic method almost invariably classify in exactly the same order when tested by the static rate of deflection tests.

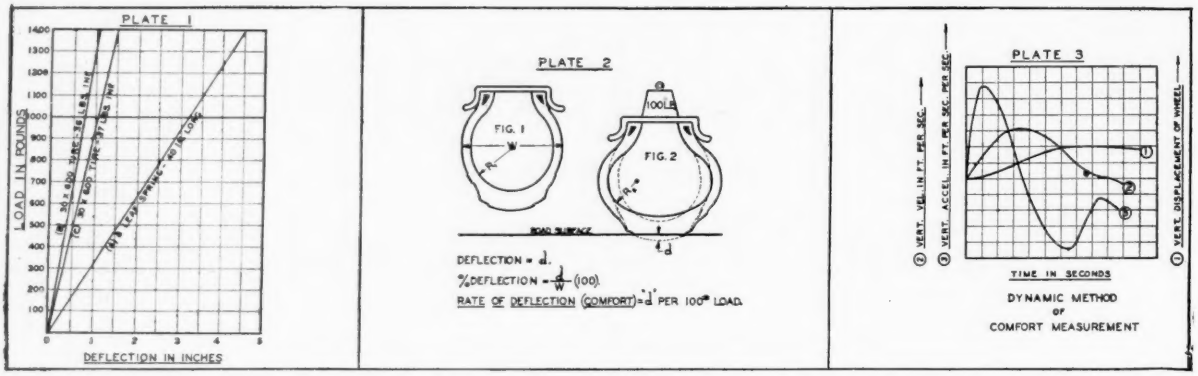
Another important characteristic of a tire is its damping effect, or inability to recover completely from a given deformation. The damping effect can be measured by mounting the tire on a beam device and allowing the tire to fall, measurements being taken of the subsequent vibrations, and the damping factor being calculated as the log of the ratio of the successive amplitudes of vibration. Damping is a measure of the amount of work done on the tire during deformation which must be evolved in the form of heat. A tire with a high damping coefficient is naturally much more

NOTE.—Publication permitted by *Ind. & Eng. Chem.* Paper read before the A. C. S. Rubber Division, Boston Group, Boston, Mass., Jan. 12, 1929. Mr. Knowland is assistant to the vice president in charge of development, Hood Rubber Co., Watertown, Mass.

[1] "Fabric Stresses in Tires." *Ind. & Eng. Chem.*, Nov., 1923.

[2] "The Tire as a Part of the Suspension System," *Auto. Eng.* Dec., 1924.

[3] *S. A. E. Jour., Mar.*, 1927.



comfortable to ride on, but its life is cut down because of the damaging effect of flexing on the stiffer carcass construction, and the higher temperatures at which it is forced to operate. The cord tire came into general use simply because it was more resilient and efficient, although less comfortable than the fabric tire, which had a higher damping factor.

The tire maker is primarily interested in the per cent deflection to which his tires will be subjected. The tire consumer, on the other hand, is primarily interested in the rate of deflection under load. Both, however, are vitally interested in the cost per mile. If a tire is inflated and then subjected to varying loads, it will be found that the per cent deflection is nearly proportional to the load as shown in Plate 4. It will be noticed that at the lower inflation pressures the per cent deflection increases at a faster rate with the load than with the higher pressures. The motorist has noticed this also and has found out that the high per cent deflection obtained by lowering his inflation pressures means a rapid increase in the rate of deflection or comfort factor.

As previously pointed out, tire life is proportional, among other things, to the number and severity of the flexures to which the carcass is subjected, and that the severity of these flexures is proportional to the per cent deflection at which the tire is operated.

It has been repeatedly demonstrated that for every percentage increase in carcass deflection above 12 per cent there is a rapid and proportionate decrease in tire-carcass life. The money loss amounts to approximately $.001 per mile based on the present retail price schedules and on sizes ranging from 4.40 to 6.75. This loss is quite constant for the different sizes, and is due to the fact that the increased cost in the large sizes is offset by the decreased rate of deflection due to a 10-pound reduction in inflation pressure. Figures of this character apply only to high quality tires which are allowed to deliver full mileage. Rim width, tire diameter, tread contour, and number of plies, all have an effect on the comfort; but a discussion of these effects is outside the scope of this paper.

We will now take up the question of tire-carcass failure and consider some of the stresses to which a tire is subjected. Reference to Plate 5 will make clearer the location of the most important stresses.

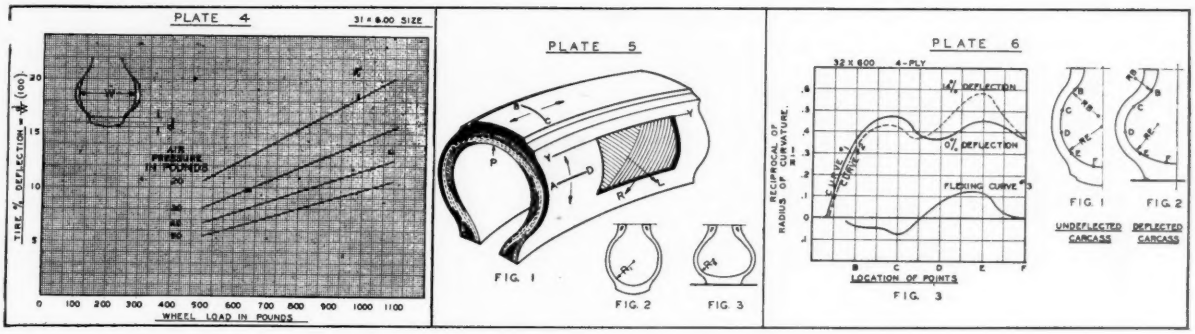
First, the inflation pressure tends to blow the tire apart along the transverse diameters such as *A D*, also along the cross-sectional diameters such as *B C*, as shown in Figure 1. These two stresses put the carcass cords in tension when the tire is inflated. The inflation pressure, however, must be corrected by the amount of pressure necessary to inflate the tube and this reduction in pressure tends to reduce the tension on the cords. The toroidal shape of the tire also has an effect on the transverse stress and tends to make it a maximum at point *P* in the tread center, gradually becoming less till it reaches a minimum at the beads. The stress intensities in the carcass can further be resolved into stresses acting along the individual cords, in direction *R* and in direction *L*, and after suitable corrections have been made for the count or number of cords per inch, the bursting stress can be calculated. It is, furthermore, possible to determine the different stresses in the different plies, and it will be found that the maximum bursting stress occurs on the inside ply at the crown of the tire at *P*.

Normal carcass failures are due, however, to the flexing or bending action which a tire undergoes when revolving on the road. A 30-inch tire, for example, will undergo 670 flexings during each mile of travel, or about 9,500,000 flexings during the tire life. Failure is eventually caused by the constant bending or flexing and by the constant fluctuation in cord tension in the carcass, as well as by the localization of the heat effects involved at the point of flexing.

During flexing on the road, an entirely new stress condition is set up, and this condition acts to increase the stress in certain zones in the cord carcass and to reduce it in certain other zones, as shown by the shaded area in the section. It is in this shaded area where the stresses continually vary from the normal, due to inflation to a minimum below inflation, that flexing trouble is most certain to occur. Carcass failures, other than accidental ones, therefore occur normally along the transverse circumference on the shoulder, at *Y*, where the greatest flexing takes place. Since the tension in some of the cords is actually lessened during the bending of the tire on the road, it would follow that carcass life is affected more seriously by the angle of bending of the individual cords than by the changes in carcass tension, although both exert an important influence.

In order to show graphically the bending action in the tire carcass as it revolves on the road, reference can be made to Plate 6. Figure 1 shows a half section of a normal uninflated carcass of a 32 by 6.00 tire and the letters *B, C, D, E,* and *F* show the points on the interior of the carcass where the bending action takes place. The radius of curvature at each of these points is indicated as *RB, RE,* etc., as shown. Figure 2 shows the same carcass section in the deflected condition, and inspection shows that the various radii of curvature have undergone a change. Practically all the radii have become smaller, indicating a sharper curvature at points *C, D,* and *E*. In other words, the curvature at all points along the carcass has undergone a change due to bending, and it is the result of these repeated changes in curvature as the tire revolves which destroys the carcass.

It is possible to evaluate the degree of curvature at any point *B* in the carcass by taking the reciprocal of the radius at *B*, that is $\frac{1}{RB}$, and the points so obtained can be plotted as in Figure 3. In this plot the abscissae are the points *B, C, D, E,* and *F*, while the ordinates are the values of $\frac{1}{R}$ or the



curvature. Curve 1 shows the degree of curvature at the different points along the undeflected carcass, and it will be noted that the greatest curvature occurs between *B* and *C*, or just above the bead, and again at *E* on the shoulder of the tire. Curve 2 shows the various curvatures of the deflected carcass when the carcass is at 14 per cent deflection. It follows that the vertical difference between curves 1 and 2 represents the change in curvature between the undeflected and the deflected condition. We are able, therefore, to plot a third curve, 3, which shows this difference, and, therefore, shows the degree of flexing at all points in the carcass. At point *B*, just above the bead, the flexing is quite pronounced and gradually increases until *C* is reached. Flexing then decreases until between *C* and *D* it falls to zero. It then increases until point *E* is reached, where it is a maximum; then falls off to zero as *F* is reached.

A study of this flexing curve which should be plotted for all new tire designs is very interesting. It shows first of all that this particular carcass will fail close to point *E*, since this is the point of greatest flexing, and that the next weakest spot is close to point *C* as indicated. It is possible, through correct tire design, to modify the flexing to a considerable degree and to displace the maximum flexing toward a point where it will do the least harm; that is, where the carcass is thinnest as at *D*. A tire carcass which fails at *C* or above the bead shows radically poor design as flexing is readily displaced at this point, and should never equal the values reached at the shoulder where the tire meets the road. So much for carcass flexibility.

As previously pointed out, the normal tire fails through tread wear. This subject is still in the controversial stage, but it is hoped to indicate at least a basis for comparison of the different factors which control abrasive wear. It is a reasonable assumption that tread wear, for a given tread compound and design, and for given road conditions and temperatures, is a function of: (1) The average pressure of the tread against the road. (2) The average tread slippage velocity. (3) The average distance of tread slippage.

In other words

$$\text{Rate of Wear} = K\left(\frac{\text{Slippage}}{\text{Velocity}}\right)(\text{Slippage distance})\ (\text{Pressure of Contact}).$$

This would seem to be borne out by the recent work of Lambourn[4], who reports wear as proportional to the (slippage)^2, and since the velocity equals the slippage distance divided by the time, the rate of wear on unit area of contact can be written

$$\text{Rate of Wear} = K\frac{(\text{Slippage})^2}{\text{Time}}(\text{Pressure Intensity}).$$

Since $\frac{1}{T}$ can be included in the constant, the wear should be proportional to the (slippage)^2 as shown by Lambourn.

[4] "Methods of Determining Abrasion," *I. R. I. Trans.* Oct., 1928.

To obtain a better picture of tread wear, it is therefore desirable to make an analysis of the pressure distribution and the slippage distribution on the tread surface exposed to the road, as shown in Plate 7.

When the tire is deflected on the road, the contact surface formed between the two is called the tread contact, and the character of this contact depends on the size and design of the tire as well as on the load and inflation pressure employed. It is, of course, on this area that tread wear takes place as the tire revolves on the road. Figures 3 and 4 are typical tread contacts for two distinct types of treads.

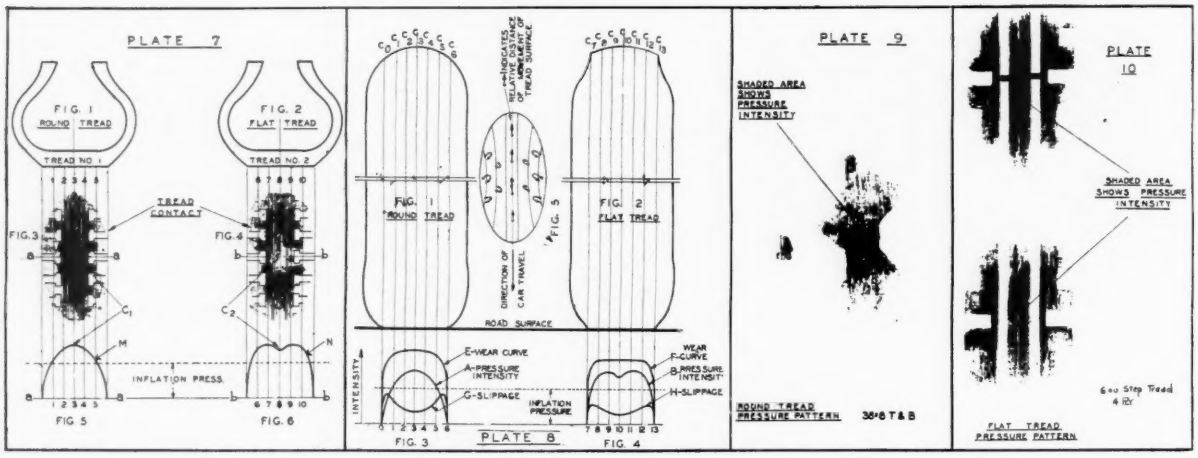
Since this tread-contact area supports the entire wheel load, it follows that the total pressure acting equals the load. It is, furthermore, obvious that if the tire were a very thin membrane, the pressure intensity over the entire pattern would equal the inflation pressure. Due, however, to the arch effect of the carcass and to the tread pattern or design, the pressure intensity varies as shown by the shaded areas in the diagrams.

Figure 3 represents the contact area formed by a rounded tread tire and Figure 4 the contact area formed by a flat tread tire, both tires being the same size and inflated to the same pressure.

In the case of tread No. 1, the pressure intensity increases from zero at the contact edges and reaches a maximum at C_1, the tread center, then falls off again to zero. This curious effect of pressure-intensity distribution is due to the arch-like support of the carcass, which in rounded tires tends to concentrate the pressure at the center of the pattern.

For the flat tread, the pressure rises from zero and reaches a maximum, then falls off at the tread center C_2. It then rises symmetrically and falls again to zero on the opposite contact edge. In a very flat tire or a very large tire it can be mathematically shown that the tread pressure at C_2 tends to approach the inflation pressure as a limit due to the absence of the arch effect of the carcass. Plate 9 shows an actual photograph made by deflecting a very rounded tread against heavy paper and the concentration of pressure at the tread center is very plain. Plate 10 shows a print of a flat tread taken in the same manner and the lessening of the pressure intensity at the tread center is very apparent.

It is possible, therefore, from an analysis of the pressure-intensity distribution shown in Plate 7, Figure 3 and Figure 4, to plot the average pressure intensities along the various sections—1, 2, 3, 4, and 5 in Figure 3, and 6, 7, 8, 9, and 10 in Figure 4, and this average for each tire is shown in Figure 5 as curve *M* and in Figure 6 as curve *N*. It will be noticed that the pressure potential for wear is very different in the two cases, being concentrated in the case of the round tread at the tread center, while in the curve of the flat tread it is midway between tread center and outside edges. The tread-pressure-intensity distribution is profoundly affected, however, by the tire size, the shape, distribution, and area percentage of the non-skid effect, and the carcass stiffness.



Having considered the effect of contact pressure between tire and road as one of the potentials for wear, we will conclude with a consideration of the slippage effects, which are brought out in Plate 8. This plate shows the round tread tire, Figure 1, and the flat tread tire, Figure 2, deflected against the road. Referring to Figure 1, C_0 to C_6 inclusive are the circumferences of the tire at various points on the tread surface, and Figure 2, C_7 to C_{13} inclusive are the various circumferences of the flat tread tire.

A casual inspection of Figure 1 shows that there is a large difference in the circumferences at different parts of the tread. For example, C_0 and C_6 are much shorter than C_3. On a 30 by 6.00-inch tire this can amount to as much as 4 per cent. Now everyone knows that as a tire makes one revolution on the road, the car travels a distance equal to the rolling circumference of the tire. But what *is* the rolling circumference of the tire? Is it C_0 or C_3? If it is C_0, then the tread at C_3 must slip backward or drag by an amount equal to the difference between C_3 and C_0. Practically, a compromise is reached and the center of the tread drags a certain amount while the outer edges slip forward a certain amount. The slip along each one of the sections should be proportional to a factor which might be called the potential for slip.

While the forces acting along the different circumferences can doubtless be calculated and the distance and velocity of slip along each line established, we can refer to the recent work of Holt and Cook[5], who have determined the relative distances of slip along the different sections by means of waxed plates dusted with carborundum powder. Analysis of their pictures shows that the direction of slippage is as indicated in Figure 5 and proves that the distance of slippage for normal tractive effect is a maximum on the outside edges or shoulder and is about twice that at the tread center. The tread center drags while the shoulders move forward and many intricate lateral movements take place between the two zones of motion.

Under these conditions it is possible to represent the slippage by curve *G* in Figure 3 and as curve *H* in Figure 4. The difference in shapes of the two curves is due to the fact that there is less difference in the various tread circumferences on the flat tread tire. The total slippage is, therefore, decreased on this tread as compared with the rounded tread, but the ratio of center movement to edge movement is about one-half in each case.

If we apply an approximation of the wear formula suggested as a function of pressure times (slippage)^2, the wear curve *E* for the round tread, Figure 1, and the wear curve *F* for the flat tread, Figure 2, can be drawn approximately as shown.

In conclusion, I wish to point out that the analysis of tread wear just suggested is not intended to be other than qualitative. It must be borne in mind that a new tire has certain potentials for wear along certain transverse sections, and that along certain of these sections wear will proceed very rapidly at the start. As these sections wear down, the pressure potential is shifted to other sections and the ultimate result is an equilibrium where the wear per unit area tends to become uniform on all sections in the contact area.

[5] "Measurement of the Tread Movement of Pneumatic Tires and a Discussion of the Probable Relation to Tread Wear." Research Paper No. 2. *Bu. Stand. J. R.*, July, 1928.

Holds Fluid Insulation on Cable

The efficiency of a new type of high-speed ocean telegraph cable depends, it is said, almost as much on a new method of covering the conductor with hard rubber insulation as on the fact that the core is formed of wire loaded with a new alloy instead of iron wire to give greater electrical permeability at low magnetizing force. On account of the greater sensitiveness of a conductor thus loaded, the utmost protection must be given it from mechanical strains induced by hydrostatic action exerted on it at sea bottom. A suitable cushioning effect is obtained by impregnating the loaded conductor with a liquid bitumen which remains fluid in cold, deep water. Ordinarily, a rubber compound could not be vulcanized on a core thus treated as the liquid bitumen would blend with the rubber in curing the latter and become hard and useless. In the new process the insulating compound is first vulcanized, then made plastic, and the prevulcanized mass is extruded in a new type of extruding machine in the continuous sheath about the conductor as the latter passes through it at about 150°C. and at a steam pressure of 1,000 to 2,000 pounds.

A suitable insulating compound is made by working sheets of vulcanized hard rubber between heated rolls of a standard milling machine with hard bitumen to increase plasticity, and the mix, consisting of rubber 60 per cent, bitumen 20, and sulphur 20, is vulcanized at 90 to 100 pounds pressure. Before using it in the extruder the vulcanizate is rendered plastic on heated rolls. A semi-hard rubber with a sulphur content as low as 15 per cent may also be used.

Industrial Drafting as *applied to the* Rubber Industry

FRED S. GRIFFIN

¶Much has been written about drafting-room administration in general, but little has been published on this subject as applied to the rubber industry. The management of a progressive firm certainly can not fail to see the importance of a properly organized and conducted drafting department.

UNLESS the matter is given some consideration, we do not realize how important a part the draftsman plays in the construction and operation of our large industrial plants. Before the factory is even built, we start with a map showing the layout of the property. Then, through the period of construction and the layout and the building of equipment, all work carefully follows the painstaking efforts of the draftsman. Much of the information contained in this article was obtained from the writer's experience obtained in some of the large rubber plants of Akron.

The Nature of Drafting

Although it is the purpose of this article to discuss the nature of the drafting work that is done by some of our large rubber industries, nevertheless, much of this could be applied in a general way to other lines of manufacture. In many respects their problems are common. The buildings must be designed and constructed. The machinery and equipment must be carefully located and installed, and all progressive firms find it necessary to design much of their own machinery. Then, after a plant is put into production, there is the problem of maintenance and the design of new machines and processes, all tending to improve either the product or the method of manufacture. Then, too, in case of the expansion of the plant, many new problems will arise.

Systematic Drafting

In the case of a very small factory, it is often possible for the superintendent to keep in such close touch with the product that is being made and the machinery used, that he can direct the work without any, or with at least very few drawings. As the plant increases in size, it is impossible for him to maintain this intimate contact, and it becomes necessary to work out the plans in the office and turn them over to the shop in the form of blue prints. As the plant grows, the chief engineer may be able to handle all of this work with the aid of possibly two or three draftsmen. There is, however, one danger that might result from this method. The engineer may be so busy with his administrative and construction duties that he will not have sufficient time to properly direct the drawing work. Drafting is naturally a work embodying a large amount of detail, and unless this can be given very careful supervision, a waste of time and costly errors may result. Certain systems should be developed that apply to your particular line of work. Drawings should be made on standard-size sheets, given an appropriate title, numbered, and filed. The writer has known of cases in small plants where many of those items were neglected and the work was done in a slipshod manner.

NOTE: Mr. Griffin is professor of mechanical engineering at the University of Akron, Akron, O.

Department Organization

If the plant is large enough to employ from five to twelve draftsmen, the work should all be done in one department under a competent chief draftsman, while the still larger plants will find it advantageous to divide the work into separate departments. The departments that have been created in some of the large plants are as follows: machine design, development, general engineering, and sometimes a planning or industrial engineering department. If there is sufficient amount of work and the management considers it advisable, other departments might be organized. The writer knows of one plant where a few draftsmen are employed in a separate department that has charge of architectural work pertaining to the sales department.

Specialized Work

Just when it is best to organize a separate department is a problem that must be worked out for each individual case. By allowing the supervisor and his assistants to specialize on one branch of work, it is certain that better and more efficient work will be done. On the other hand, the overhead expense will be increased and sometimes it is a disadvantage to have men employed that you can not shift from one kind of work to another.

Sometimes one or two men may be employed on some special work and the drafting may be done in some part of the factory other than the main drawing room. In this case the work should be supervised to see that the draftsmen are conforming to the general standards. The drawings should be made on the standard-size sheets, numbered, etc., and when finished, should be filed in the main drawing room. Unless this is done, important work may be misplaced and lost. It is the opinion of the writer that this policy should not be followed to any great extent, and as a general rule, it would be better to do the work in the main drawing room and keep it centralized as much as possible.

Machine Design

Upon the machine-design department rests a great responsibility. It must keep the machinery and equipment up to date, and must constantly develop labor-saving machinery in order to cut down the cost of production. Here the best

type of draftsman that can be secured should be employed. The leader should not only be a man well versed in machine design and the various processes of manufacture, but he must be a man who is possessed with considerable inventive ability. Many men who are good engineers are not so endowed. A fundamental fact relative to the operation of this department should be mentioned. It is practically impossible to design an entirely new machine and have it work satisfactorily the first time without making changes and improvements. Consequently, the first machine should be built under the direct supervision of the machine-design department so that errors, changes, and improvements in design can be made during the process of construction. Then it should be thoroughly tested before it is put into production and before any similar machines are constructed.

Product Designs and Specifications

The design and specifications of the finished product are worked out in the development department, and it has been found that the exact size and shape can best be determined by the use of the drawing board. As many rubber products are made by the molding process, the next step is to design the necessary mold. All of the large tire factories have spent large sums on the designs of tires and molds, and hundreds of designs that were popular just a few years ago are now obsolete. After the development engineer has determined the number of plies of fabric, the design of the tread, the thickness of the tire at important sections, and a few other general sizes, the draftsman makes a careful layout in which all dimensions are accurately determined. In order to avoid any error in the design, this layout should be made at least twice the actual size, and it is often a better policy to draw it four times the actual size. After the layout is approved, the draftsman proceeds with the mold drawing.

The work of this department requires a draftsman who is extremely neat, careful, and accurate. Many men who are very capable at other kinds of drafting are not accurate enough for this work. On the other hand, some men who are poor in machine design or plant construction work because they possess no design or inventive ability, may become quite valuable here, provided they are accurate and are very capable in handling their drawing instruments. The scope of the work handled by this department is not necessarily limited to that mentioned above. Sometimes it is found advisable to develop machines and devices for experimental and testing purposes.

General Engineering

The work of the general engineering drafting room is so diversified that it is difficult to classify. Some of the important classes of work that might be mentioned are maps of property, building construction including changes and repairs, machine design, layout of machinery, piping layouts, foundations, mechanical transmissions including gears, chains, belts, and shafting, heating and ventilation, electrical layouts, and power-plant work.

When a new factory or a large extension to the present plant is proposed, the job should be handled by an engineering firm that specializes in factory construction. However, a few firms design their own buildings. This should not be undertaken unless you have men who are well qualified to handle construction work.

When the building plans are made by an outside firm, there are still many layouts that must be made by your own engineering department. The buildings should be adapted to the machinery to be installed. The floor loads must be determined, openings made in the floor for elevators and conveyers, and for many other reasons special construction of the building is necessary. These problems must be carefully thought out and worked out before the engineers can complete the building plans. It is often impossible to foresee all of these items and especially changes that may be necessary during future development. For these reasons it is necessary to make changes in the buildings from time to time which require carefully made plans. Sometimes small buildings are built on some part of the company's property. These can usually be designed in your own drafting room.

Special Machinery

Although most of the new machines originate in the machine-design department, a few are often designed in the general engineering drafting room. When any of the engineers in charge of maintenance have ideas for new machines, the designs are usually worked out here.

Owing to the nature of the work, it is sometimes difficult to find men who can adapt themselves to so many different varieties. So many draftsmen have had their training in specialized lines, such as machine design, structural, architectural, or power-plant work. Probably one of the best ways to have qualified men is to select young men and train them in your own department. To make a success, the young man should have a natural liking for construction work, and he will have a decided advantage if he has had at least two or three years' training in an engineering college. A fundamental knowledge of mathematics, drawing, mechanics, and strength of materials is necessary. A few years of shop or general construction experience are also essential.

Industrial Engineering

Not all firms maintain a planning or industrial engineering department. Sometimes such a group is employed only during the construction of a new plant or when important changes are taking place. This work requires men who are making a special study of production methods. Their drawings consist of layouts of machines, conveyers, equipment, and, in fact, any ideas that will increase or improve production methods and thereby cut down the cost. When their suggestions require a new machine or a radical change in the present installation, the detail drawings are often made in one of the other drafting departments. If not more than two or three men are engaged in this work, it is better to have the drawing done in the engineering drafting room.

Drafting-Room Administration

Much has been written in text books and in various technical magazines relative to drafting-room administration, and it is not the purpose of this article to discuss many of these problems. Drafting work can be done better and cheaper by employing well-qualified men and by paying them good salaries. Five good men will do more and better work then ten mediocre ones. Of course, there should always be some younger and less experienced men in training, but unless they are showing a strong inclination to work and to learn, they should be dropped. Efficient work can not be accomplished by constantly requiring men to hurry. If the work can be scheduled to progress in a regular and orderly manner much time and expense will be saved in the end.

Some concerns will go without a machine or some equipment for a period of years and then suddenly decide upon it and insist that it be in operation in a few days.

Some plan of promotion should be adopted so that when a vacancy occurs, one of the better qualified draftsmen will be given an opportunity for advancement. Drafting is naturally a confining occupation, and if a draftsman can occasionally be transferred to some special construction job, or be sent out of the city on some business pertaining to his work, he will greatly appreciate the change.

The management of a progressive firm certainly can not fail to see the importance of the work that is turned out by the draftsmen. If these departments are well organized and conducted, they will be a great asset to the organization.

A. C. S. Meeting

Rubber Division

The Seventy-seventh Meeting of the American Chemical Society was held April 29-May 4, 1929, at Columbus, O.

The Rubber Division convened Wednesday morning, May 1, at the new Chemical Laboratory of Ohio State University. The meeting was called to order by Vice Chairman Stanley Krall, Chairman A. H. Smith, being absent on a business trip. Two hundred and fifty members were in attendance during the entire session.

At the business session of the executive committee a committee was appointed to draw up rules governing the submitting and presenting of papers before the division. It was the consensus of the meeting, inasmuch as the next two regular meetings of the Society are to be held somewhat out of the area of the rubber industry, that no program be arranged for the Minneapolis meeting, but instead that the Akron or New York group serve as host to the division and arrange for a symposium to be held late in September or the first week in October.

In the evening a delightful banquet was served at the Neil House, the committee in charge being Messrs. Eide, Reel, and Easley. Between the courses vaudeville acts were provided for entertainment. Charles Milton Newcombe also spoke in a most pleasing manner, using as his theme "The Psychology of Laughter." R. P. Dinsmore acted as toastmaster and introduced Doctor Howe and Doctor Parsons, who spoke in rather flattering terms concerning the activities of the Rubber Division. Doctor Howe called attention to the fact that the division is large enough and active enough to think of compiling a monograph dealing with the rubber industry of today.

Abstracts of Papers

Effect of the Presence of Magnesium Oxide or Zinc Oxide on the Products of the Destructive Distillation of Natural Rubber. Natural rubber has been mixed with zinc oxide or magnesium oxide, and destructively distilled. In each case the distillates have been fractioned; ethylenic, dienic, hydroaromatic, and aromatic compounds have been obtained. These results have been compared with those obtained by distillation of natural rubber alone and in the presence of metallic zinc or magnesium. A mechanism of decomposition is tentatively suggested, which would account for the observed facts. —Thomas Midgley, Jr., and Albert L. Henne.

Influence of Pigments on Some of the Physical Properties of Unvulcanized Rubber. Information is presented regarding the influence that pigments have on some physical properties of unvulcanized rubber. Reasons are given for believing that the relative insolubility of unvulcanized rubber containing fine pigments is due to flocculated pigment forming a semipermeable membrane that prevents the rubber aggregates from diffusing out into the solvent. Evidence is given regarding existence of a structure that develops in milled rubber on storage.—Harlan A. Depew.

Transformation of Energy by Rubber. Mechanical energy expended on a strip of rubber causes plastic flow and elastic strain. The energy expended to produce elastic strain is converted reversibly into heat. All physical measurements conducted on a piece of rubber record a combination of plastic flow and elastic strain. Elimination of the time factor eliminates plastic flow. If stress-strain curves are obtained in the course of a few seconds the rubber will be found to support an increasing load with increasing temperature. Vulcanized rubber shows much plastic flow at high temperature. Unvulcanized rubber shows the Joule effect and differs from vulcanized rubber only in degree. Vulcanization appears to consist in the suppression of plastic properties rather than in the creation of elastic material.—Ira Williams.

Testing Automotive Rubber Parts Assembled Under Compression. Present-day test specifications on automotive rubber parts are not only incomplete and misleading but are entirely lacking in uniformity. This is particularly true of compression and permanent set tests on automotive mechanical rubber parts assembled under compression, and an effort has been made to show the urgent need for unification of such methods. Data are presented to show that high tensile is no criterion of relative resistance to permanent set and that hardness is not a measure of deflectability. Likewise deflection and permanent set under compression are greatly influenced by the size and shape of test piece, method of cutting the sample, the gage and methods of measuring it, and condition and kinds of surfaces in contact with the test piece. Compression and permanent set testing equipment are discussed, and descriptions and cuts are offered of some newly designed laboratory equipment. One of these, the Compressetometer, has been found extremely useful in making deflection, hysteresis, and permanent set tests, the latter under constant load or constant distortion as desired.—Franz D. Abbott.

Evaluation of Reclaim Rubber in Tread Stock. A series of tread compounds were made up by proportion between a non-reclaim stock and an all-reclaim stock. These compounds were road tested, and the results shown in relative values. Physical properties of the series, such as tensile, abrasion, tear, are also shown as relative values and are compared to the road wear. It is shown that reclaim rubber has a value, judged by abrasion, of 25 to 40 per cent of new rubber. Tensile and lamination tear are shown to be reasonably good criteria of road wear.—C. W. Sanderson.

Some Observations on Carbon Black. A number of experiments on the relation of physical and chemical properties of carbon blacks to their action in rubber mixes have been made. These experiments show that (1) adsorption of black is related to rate of cure, highly adsorptive blacks giving slow curing rubber stocks, with certain exceptions, and low adsorptive blacks giving fast curing stocks; (2) the effect of heat on black is to give a dry, cindery carbon which is highly adsorptive but gives a faster curing stock; (3) a reaction product of sulphur, zinc oxide, and a material adsorbed on carbon black, has been isolated and found to have some accelerating action on vulcanization; (4) different blacks when dispersed in a rubber cement, then centrifuged, are still found to be held in suspension. The amount held in suspension is found to vary as the modulus of the black varies in a Captax accelerated, high black test stock.—C. M. Carson.

A New Flexing Machine for Rubber. A description with photographs of a device for rapid flexing of a number of pieces of rubber. The machine is for laboratory use and consists of a rotor disk keyed to the shaft of a ¼ h.p. synchronous motor and radially slotted about its periphery to take 12 samples. Around this a steel ring is placed off center in relation to the rotor. The test samples used were 1 inch wide, 1⅛ inches long, and 3/10-inch thick, having two semicircular grooves molded across their width. The motor operates at 1725 r.p.m. and in order to reduce friction, the

samples were lubricated with glycerine. The results obtained with this machine check qualitatively with the road tests which were run. It was found that certain antioxidants are valueless. Modulus and methods of processing apparently exert an influence on this phenomenon. A thermometer inserted in a mercury well in the top of the flexing ring showed considerable variations in operating temperatures.—Philip M. Torrance and Lester C. Peterson.

Los Angeles Group

A feature of the meeting of the Los Angeles Group, Rubber Division, A. C. S., after a dinner at the Pollyanna restaurant 6.30 p.m., Friday, June 14, will be a talk with illustrations on the applications of zinc oxide in the rubber industry, to be given by Harry E. Outcault of the staff of the New Jersey Zinc Sales Co., Inc., New York, N. Y. Another guest of the group will be Ernest R. Bridgwater of E. I. du Pont de Nemours & Co., Inc., Wilmington, Del.

Akron Group

The Akron Rubber Group of the American Chemical Society held the first meeting of its second year on the evening of May 20. Dinner was served in the Goodyear main dining room to about 400 chemists and technical men of Akron and vicinity. Following the dinner the group adjourned to the Goodyear theater and listened to a discussion on "Power."

Robert R. Jones, consulting engineer on power problems for The Firestone Tire & Rubber Co., opened the meeting and introduced the speakers. These included John Grotzinger, manager of the electrical engineering department of the Goodyear Tire & Rubber Co.; R. J. Gaudy, chief engineer of the Sessions Engineering Co. of Chicago, and S. Crawford, of The B. F. Goodrich Co.

Mr. Jones in his introductory remarks stated that engineers are now trying to deliver the greatest amount of horse power that can be intelligently controlled by each workman. Already this is almost three times the amount handled by the English workman.

John Grotzinger outlined the power requirements of modern rubber factories under the topics of water-circulation system, fuel consumption, power production, the most efficient routing of steam lines, and the layout of power lines carrying various voltages. At present most power is generated from coal, oil, or gas. The average cost per Kw. hr. is 8 to 12 mils although 5 mils cost is not uncommon.

R. J. Gaudy speaking on power-generation practice referred as follows to its economy: Increased boiler pressure in the new-type high-pressure boilers, and the latest design in turbines facilitates speeding up of process with corresponding greater power available for machines.

Within the past few years, the use of heat economizers and pulverized coal have made greater efficiency possible. In general it may be said that it is cheaper to purchase the power than to generate it..

C. P. Crawford sketched the history of power machines, presenting the establishment of proper motor sizes for certain machines and loads, the determination of friction ratios when gears were working at peak loads, and the comparative efficiency of motor-driven and gear-driven machinery such as mills, calenders, and conveyers used in rubber manufacture. Synchronous motors are better suited for most purposes than straight induction motors. The power required by an 84 inch mill can be supplied, even for peak loads, by a 125 h. p. motor.

Future meetings of the Akron group will consider the handling of inflammable liquids, tire designs, and rubber as a material for engineering.

The present officers of the Akron Group are George K. Hinshaw, chairman; K. D. Smith, vice-chairman; and C. W. Sanderson, secretary-treasurer.

New York Group

The second meeting in 1929 of the New York Group will be held at 6 p.m., on Friday, June 21, at the Town Hall, 123 West Forty-third St., New York, N. Y.

The subject matter for discussion will be "Natural versus Artificial Aging." This subject is of much practical importance and scientific interest, since it must still be admitted that a very great gap remains between the information obtainable from artificial aging and the course of natural or shelf aging.

An attempt will be made at this symposium to treat the subject in a more quantitative manner than has hitherto been done. For example, the actual degree of correlation between natural and accelerated aging on a variety of compounds will be quantitatively expressed.

The broad scope of this symposium and the bearing of the aging problem will be covered by several of the best-known rubber chemists representing the major divisions of the rubber industry.

Papers on various aspects of the aging problem will be presented by John M. Bierer, assistant factory manager and technical superintendent, The Boston Woven Hose & Rubber Co.; W. L. Sturtevant, chief chemist, Manhattan Rubber Co.; W. W. Vogt, manager of compounding, The Goodyear Tire & Rubber Co.; A. H. Nellen, chief chemist, Lee Tire & Rubber Co.; Sidney M. Cadwell, research chemist, General Laboratories, U. S. Rubber Co.; and Stanley Krall, chief chemist, Fisk Rubber Co., the title of whose paper is "Natural vs. Artificial Aging."

The papers will not exceed fifteen minutes each for delivery. An interesting feature of the meeting will be a critical discussion of the papers by outstanding technologists.

The musical program will include special numbers by the "Manhattan Agonizers," and New York Group songs that were so successful at the last meeting.

A very large attendance is expected at this symposium. Reservations for the usual dinner should be made at an early date with the secretary-treasurer, W. H. Cope, care of R. T. Vanderbilt & Co., 230 Park Ave., New York, N. Y.

Automobile Production Increases

The automobile output of 664,005 units in April was again a monthly record. This makes a total output for the first four months of the year of 2,209,538 units, or 50 per cent above the average for the first four months of the preceding five years. Sales figures for all makes of automobiles are not currently available, but General Motors dealers' sales to users, reported for the first three months of this year, were only 5.9 above those for the first quarter of 1928, and for April, not quite 7 per cent above April of last year. Increased exports accounted for 26.2 per cent of the increased production during those three months, and were 86.2 per cent greater than a year ago. Exports during the first quarter this year consumed 19.7 per cent of production as against 16.2 per cent during the first quarter of last year. Total new-car registrations made a gain of 49 per cent during the first quarter of 1929 as compared with those of the first quarter of 1928; an increase which is largely credited to the Ford car which was not in the market in large numbers a year ago.

American Society For Testing Materials

THE thirty-second annual meeting of the American Society for Testing Materials will be held at Atlantic City, N. J., June 24-28, 1929.

Committee D-11 on Rubber Products, L. C. Conradi, chairman, is cooperating with a committee of the American Chemical Society in studying physical test methods. Considerable work is being carried out on flexure, abrasion, and artificial life or aging tests.

At the annual meeting this committee will present revisions in the tentative methods of chemical analysis of rubber products; report progress in the work on abrasion testing, hardness testing, and life tests of rubber products; report cooperation with the National Electric Light Association in the development of specifications for rubber gloves for electrical workers on apparatus or circuits not exceeding 8,000 volts to ground.

A paper will be read on procedure for testing compounds that must withstand repeated compression, such as solid tires, by H. A. Depew and E. G. Snyder. This describes the pounding of rubber cylinders 3¾ inches in height by 5 inches in diameter, with 2,500-pound blows struck three times per second, and the determination of the resultant increase in temperature. The method of vulcanizing the cylinders and the uniformity of the cure will be shown, together with the compounding data.

The spring meeting of Committee D-13 on Textile Materials was held in Boston on March 14 and in Lowell on March 15. The committee has before it the following problems: developing standard performance tests, such as tear and abrasion tests; the effect of changes in temperature and humidity on stretch in tire cord; checking the corrections of the 12 per cent regain in raw wool; determination of sizing and loading; over-bleaching; proper removal of bleaching materials; fastness of dyes to light and water; and a suitable gage for gaging fabrics in accordance with the standard methods of the committee.

It was suggested that the committee submit its standards to the various groups working with the American Standards Association for their approval before submitting them for approval by the A. S. A. The committee is recommending for advancement to standard the tentative specifications for 23/5/3 carded American tire cord and for certain light and medium fabrics. The committee is also proposing for adoption as tentative the specifications for 8, 9¼, 12, and 14-ounce chafer fabrics, and specifications for asbestos tape for electrical purposes.

Sponge Rubber in Transfer Rollers

To lessen cost, obtain a more uniform impression, and overcome a tendency for the surface of such cylinders to crack or lose shape in changes of weather, a new composition roller is now made for printing and intaglio machines and for processes involving the transfer of pigment patterns from etched rollers or plates. In contrast with older types of rollers with their heavy single coating of glucose, gutta percha, etc., the new roll is light, economical, and easily handled. It has either a solid or a hollow core. In the latter form the core is first covered with a relatively thick jacket of sponge rubber with a smooth finish, and upon the latter is molded the outer or contact layer of gum composition, which can be relatively thin. Pressure is maintained while the composition is setting. The mutual expansion of the united materials is said to prevent parting of the layers, and to insure maximum resiliency in the roller with the especial advantage of firm compression at the ends.

National Exposition of Chemical Industries

THE Twelfth National Exposition of Chemical Industries was held in the Grand Central Palace, New York, N. Y., May 6 to 11, 1929.

Practically every chemical industry was represented by the 380 or more exhibitors of equipment, processes, products, and sources of raw material supplies.

Many of the exhibits were of interest directly or indirectly to chemists and others in the rubber industry. Among such exhibits were the following:

The American Hard Rubber Co., New York, N. Y., featured hard rubber equipment in the form of pumps, rubber lined tanks, pipe, etc.

Barco Mfg. Co., Chicago, Ill., displayed a full line of lubricated plug valves and flexible joints.

The Bristol Co., Waterbury, Conn., showed a full line of indicating and recording instruments, temperature controllers, and control valves for the chemical industries.

The J. H. Day Co., Cincinnati, O., exhibited for the first time an experimental Mogul kneading and mixing machine with interchangeable agitators, also a Mogul vacuum kneader and mixer with the same agitator feature. Other machines shown by this company were a 3-roll mill for grinding inks, etc., and a new 3-speed emulsifier.

J. P. Devine Mfg. Co., Buffalo, N. Y. displayed a representative group of vacuum dryers, evaporators, and impregnators.

Eimer & Amend, New York, N. Y., exhibited apparatus of their own and imported manufacture. Of particular interest to rubber chemists and compounders was Young's improved gravitometer of unique and scientific design especially for determining rapidly and accurately the specific gravity of samples of compounded rubber.

Luzerne Rubber Co., Trenton, N. J., exhibited the usual line of hard rubber pipes, fittings, etc., for chemical works.

Miner Laboratories, Chicago, Ill., makers of furfurol products, displayed ultra-accelerators for rubber work.

National Rosin, Oil & Size Co., New York, N. Y., showed a group of rosin products, some of which were of rubber compounding interest.

United States Rubber Co., New York, N. Y., featured rubber lined containers, including rubber lined pressure and storage tanks, rubber lined drums for acid transportation, rubber lined valves and pipes, hard rubber pipes and fittings, and a cross section of a pressure tank showing how it may be emptied by the use of air pressure.

Rubber Trade Inquiries

The inquiries that follow have already been answered; nevertheless they are of interest not only in showing the needs of the trade, but because of the possibility that additional information may be furnished by those who read them. The Editor is therefore glad to have those interested communicate with him.

Number	Inquiry
1228	Trays for restaurants and hotels made of rubber, or metal, or any other material covered with rubber.
1229	Manufacture of rubber boats, rubber dogs, and other items used at the beaches.
1230	Source of rubber oil, especially for use in the manufacture of acid and alkali resisting paint.
1231	What is Para Fab? From whom can it be obtained?
1232	Manufacture of inflatable rubber model of the human body.
1233	Source of supply of rubber brine-freezing bags.

Dealers' Stocks of Automobile Tires

As of April 1, 1929[1]

FINAL statistics compiled by the Rubber Division, and here tabulated, show the stocks of automobile casings, inner tubes, and solid and cushion tires held by dealers reporting on April 1, 1929, as compared to April 1, 1928. The final average number of casings per dealer is 94.4, an increase of 4.1 over the average in the preliminary report issued on April 12, 1929.

The comparison of dealers by volume of stocks indicates that the percentage of dealers stocking less than 10 casings has declined sharply, and that the percentage of dealers reporting stocks of over 100 casings has increased sharply. To some degree, this is the result of co-operation in the survey for the first time by the National Tire Dealers' Association; its membership consisting of the more important dealers naturally caused an increased number of reports from dealers having larger than average stocks. The result of the present survey is therefore not exactly comparable to that of April, 1928.

While the average casings-per-dealer figure has increased with each succeeding year, it is believed that total stocks held by dealers have not increased in equal ratio, because the total number of tire dealers is now less than formerly. For example, the mailing list used in the surveys in 1925 and 1926 consisted of about 175,000 names; in 1927 and 1928, about 135,000 names; and in the present survey, about 110,000 names. Not all the names on the mailing list were active tire dealers. It is the consensus of opinion among trade statisticians that the number of firms and individuals dealing in tires, especially small retailers, has been greatly reduced.

Dealers were asked to report whether they were handling one, two, three, or more makes of tires. An analysis of the reports shows a greater percentage of dealers concentrating sales efforts on one make than in preceding years.

The average stock of automobile tires held by the average tire dealer in the United States on April 1, 1929, was 94.4, and the average number of inner tubes was 143.5. In the accompanying table the states have been reported in the geographic divisions recognized by the Bureau of the Census in its census returns. The group "Unallocated" has been added to include questionnaires for which the proper state allocation was not known, and to tabulate returns received too late to be included under the state named.

In the surveys of October 1, 1928, and April 1, 1929, dealers were asked to report whether or not they sold tires on instalment. An analysis of the affirmative replies to this question, by geographic divisions of the United States corresponding to those shown in the accompanying table, reveals a very slight increase in the percentage of total dealers selling tires on instalment, 22.33 per cent for April 1, 1929, as compared with 22.32 per cent for October 1, 1928. The following geographic divisions showed an increase: New

Dealers' Stocks of Automobile Tires

	April 1, 1928			April 1, 1929		
	Number	Dealers Reporting	Average Per Dealer	Number	Dealers Reporting	Average Per Dealer
Total casings (including balloons)	2,514,112	30,974	81.2	2,383,907	25,245	94.4
Balloon casings	1,008,223	22,039	45.7	1,400,528	20,279	69.1
Inner tubes	3,816,169	30,933	123.4	3,577,892	24,928	143.5
Solid and cushion tires	37,873	1,403	27.0	40,151	1,146	35.0

DEALERS' STOCKS OF AUTOMOBILE TIRES BY STATES, APRIL 1, 1929

	Total Casings			Balloon Tires		Inner Tubes		
	No. of Dealers Reporting	No. of Tires on Hand	Average No. Per Dealer	No. of Dealers Reporting	No. of Tires on Hand	No. of Dealers Reporting	No. of Tubes on Hand	Average No. Per Dealer
New England								
Maine	422	31,539	74.7	351	19,064	425	49,609	116.7
New Hampshire	202	16,854	83.4	170	10,047	201	22,737	113.1
Vermont	175	9,325	53.3	145	5,845	170	15,700	92.4
Massachusetts	798	90,959	114.0	667	56,254	787	135,699	172.4
Rhode Island	96	7,632	79.5	76	3,769	94	11,713	124.6
Connecticut	240	25,335	105.6	219	16,580	245	33,365	136.2
Middle Atlantic								
New York	1,396	156,012	111.8	1,168	85,622	1,378	228,790	166.0
New Jersey	514	73,807	143.6	440	49,097	504	97,363	193.2
Pennsylvania	2,222	186,096	83.8	1,768	175,168	2,176	259,451	119.2
East North Central								
Ohio	1,444	141,770	98.2	1,166	82,956	1,400	194,200	138.7
Indiana	940	82,165	87.4	744	47,444	923	125,714	136.2
Illinois	1,280	115,025	89.9	1,021	70,596	1,225	179,235	146.3
Michigan	869	71,724	82.5	684	42,882	863	119,205	138.1
Wisconsin	987	92,871	94.1	785	49,272	972	142,602	146.7
West North Central								
Minnesota	795	85,752	107.9	635	38,948	772	123,761	160.3
Iowa	944	75,811	80.3	756	39,066	931	121,829	130.9
Missouri	740	80,214	108.4	590	44,705	740	116,381	157.3
North Dakota	398	29,979	75.3	307	13,600	399	49,681	124.5
South Dakota	290	20,883	72.0	233	10,302	291	36,588	125.7
Nebraska	469	35,512	75.7	372	19,354	463	57,985	125.2
Kansas	641	54,852	85.6	502	30,243	621	87,657	141.2
South Atlantic								
Delaware	48	3,929	81.9	35	2,072	45	7,274	161.6
Maryland	317	26,423	83.4	229	13,615	315	36,743	116.6
District Columbia	63	8,990	142.7	57	5,509	58	12,712	219.2
Virginia	594	32,185	54.2	437	16,597	585	51,567	88.2
West Virginia	335	28,662	85.6	253	14,376	337	41,870	124.2
North Carolina	399	45,257	113.4	317	23,153	388	71,968	186.0
South Carolina	243	13,454	55.4	179	6,082	246	26,732	108.7
Georgia	307	28,179	91.8	242	15,635	308	46,490	150.9
Florida	283	41,464	146.5	234	26,495	283	54,029	190.9
East South Central								
Kentucky	318	28,418	89.4	260	14,622	312	46,224	148.2
Tennessee	243	29,464	121.3	194	14,259	245	44,567	181.9
Alabama	286	26,749	93.5	238	16,807	280	42,957	153.4
Mississippi	288	22,199	77.1	218	9,542	283	43,644	154.2
West South Central								
Arkansas	314	26,712	85.1	241	13,854	315	42,395	134.6
Louisiana	220	28,955	131.6	176	16,124	215	51,282	238.5
Oklahoma	378	44,426	117.5	311	23,458	366	67,929	185.6
Texas	1,007	117,456	116.6	817	58,620	980	192,725	196.7
Mountain								
Montana	244	18,675	76.5	191	10,389	348	29,937	86.0
Idaho	172	15,532	90.3	140	9,091	174	22,725	130.6
Wyoming	104	7,834	75.3	86	5,328	104	12,795	123.0
Colorado	363	41,977	115.6	299	23,144	364	54,906	150.8
New Mexico	121	9,128	75.4	94	5,008	119	14,530	122.1
Arizona	143	10,828	75.7	117	6,659	137	15,960	116.5
Utah	155	17,765	114.6	122	10,832	154	26,218	170.2
Nevada	39	3,666	94.0	29	2,063	37	5,215	141.0
Pacific								
Washington	553	38,220	69.1	463	21,487	542	52,415	96.7
Oregon	310	26,174	84.4	263	14,179	296	35,752	120.8
California	1,299	134,256	103.4	1,052	77,309	1,283	183,511	143.0
Unallocated	237	22,813	96.3	186	13,405	229	33,555	146.5
Total U. S.	25,245	2,383,907	94.4	20,279	1,400,528	24,928	3,577,892	143.5

[1] Special Circular No. 2309, Rubber Division, Department of Commerce, Bureau of Foreign and Domestic Commerce, Washington, D. C.

England, Middle Atlantic, East North Central, West South Central, and Pacific; while the following showed a decrease: West North Central, South Atlantic, East South Central, and Mountain.

In the survey of last October, reports of stocks on hand were received from three large mail-order and chain-store houses. In the present survey the number of such reports received thus far is not sufficient to make possible publication of statistics without disclosing the position of reporting companies. Reports received, however, indicate an increase in such stocks over the figure of 615,508 casings and 730,889 inner tubes reported for last October.

The MONOTRON

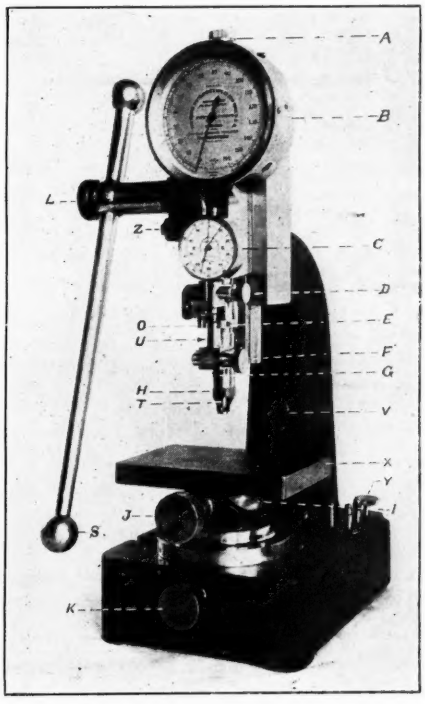
Standard Universal Constant Diameter Hardness Indicator

THE Monotron is a static mechanical pressure machine acting on a small diamond ball impresser point through an especially designed high duty weigher or pressure scale. The resulting depth of impression while under load is measured by a second dial which is a standard micrometer gage reading in 1/5000-in. and also 1/200 mm. The graduated scale has a capacity of 160 kilograms and also reads in pounds, i.e. up to 352. The use of this combination has been made practical by the introduction of a compensator device which serves to correct the hitherto unavoidable depth indication errors due to contraction of parts in the machine and the diamond itself when under strain.

The object of a machine so constructed is to provide for the measurement of what is known as quantitative and qualitative hardness in metals and all other materials as minerals, glass, and organic compounds as rubber, etc., which is not possible in any one form of equipment heretofore available.

Description

This machine has a vertical clearance of seven inches, although it may be made of any larger capacity. It has a removable tilting table so that samples of any odd shape may be leveled up for the test. With it are supplied a selected set of impressers, as follows: a ¾ mm. diamond ball point for universal application; a 1/16-in. and a 2½ mm. ball chuck for specializing on the softer metals, and a ¾ mm. flat parallel-sided punch. The pressure gage *B* has a sturdy adjustable built-in micrometer gear set, while the depth gage *C* is removable and reads in 1/5000-in. or 1/200 mm., although special gages of greater or less magnifying power may be used. There are two sets of numbers on the depth gage, the inner and larger ones, reading clockwise, are for measuring depth of penetration of the test specimen in the regular way, that is, when the hardness indications are taken from the graduations on the pressure scale, using a constant depth such as the adopted standard of 9 divisions. On the outside the numbers are less prominent, reading counter-clockwise. These are for the purpose of taking hardness readings in some instances by use of a constant pressure and variable depth, of which the latter would be the hardness indication. There has been little demand for indications of this kind and the method is not advocated by us except for measuring flow in the test specimen.



Monotron Model A, with Removable Tilting Table

Operation of the Machine

In order to obtain the regular constant depth variable pressure hardness readings as described, the measuring head *B*, which is provided with the diamond protective cap *H* at its lower end, and which is also a contactor member for operating the depth gage *C*, is brought down to the surface of the test specimen through the medium of the hand-lever *S*. This hand-lever may be set in any convenient working position by the knob *L* and the intermeshing ratchet teeth that it controls. It will be noted that cap *H* is open in front so that not only is the impresser point exposed to view, but the exact spot to be tested is locatable by bringing it central with the opening in the bottom of it. Having done this, the impresser point *T* is brought down also to contact with the test specimen by further movement of the lever *S*; then the hand of the micrometer gage *C* moves and comes to a responsive position at which it stops.

It is then set to zero by thumbscrew *F*.

Lever *S* is then moved still farther until the idler pressure bar carrying the impresser *T* and micrometer *C* contacts with the scale mechanism in casing *B*.

At this stage, impresser point *T* penetrates the specimen, and the pointer hand in gage *C* indicates the extent thereof, while the indicator hand in gage *B*, as before mentioned, indicates the amount of pressure required to penetrate the desired depth. The hardness readings are then taken while the pressure is still on.

Lever *S* is then brought back in preparation for the next test.

If the surface of the specimen is flat, the depth gage need not be reset to zero each time a test is made.

NOTE.—Monotron is the Greek abbreviation of Unit Measure. Data used in this article from Shore Instrument & Mfg. Co., Jamaica, N. Y.

EDITORIALS

A Welcome Merger

WHILE the dissolution of the Rubber Institute, Inc., that had been launched under most promising auspices, may occasion regret, its passing and the transference of its activities to the new Rubber Manufacturers' Association, Inc., as the old Rubber Association of America is now known, is quite in line with the best business ideals. The wisdom of maintaining two national organizations of rubber industrialists, both functioning along somewhat similar lines and with purposes and accomplishments ever tending to overlap, has been seriously questioned since the advent of the newer body. Many astute leaders have felt, mindful of "the house divided against itself," that the operations of two such bodies, causing much duplication of effort, was unsound in theory and uneconomic in practice; yet they believed that the ambitious, well-endowed, younger organization was at least entitled to a chance to prove its usefulness, and hence they withheld adverse comment.

However, an awkward situation has been judiciously corrected; and now with the data and experience of the newer body added to the rich store of knowledge garnered by the older one, and aided with the pioneer's well-earned prestige, the latter organization is in a more favorable position than ever for enhancing the larger interests of the American rubber industry.

Vulcanization by Trinitrobenzene

WHEN some fourteen years ago Dr. Iwan Ostromislensky published his treatise on vulcanization in which he maintained that for the efficient curing of rubber, sulphur was not only dispensable but might even be improved upon with other vulcanizing substances he named, the announcement was received by some as a curious scientific suggestion of doubtful utility, but resented by many as an unorthodox and impossible pronouncement that violated one of the most cherished traditions of the rubber industry. For three-quarters of a century sulphur had been fairly regarded the *sine qua non* of vulcanization. Research had indeed indicated that agents other than sulphur or its derivatives would also cure rubber, but cost and difficulty in application made them rather negligible factors. In fact each succeeding disclosure seemed but to emphasize the importance of sulphur.

Like many another originator, Dr. Ostromislensky suffered through the ill-directed efforts of those who sought fairly or otherwise to test or utilize his discovery. Through not adhering to formulas and methods indicated, they got results that were disappointing; and, chagrined at their failures, they alluded to the discoverer as self-deluded and sought to discredit the revolutionary finding as something of inconsequential value. As for his conception of the mechanism of vulcanization, it was simply ridiculed. Undismayed by the storm of adverse criticism that he had aroused and encouraged by men of far vision, he wisely bided his time, meanwhile conducting exhaustive experiments and tirelessly checking and rechecking the voluminous data of years.

Now has come to him a long-awaited chance for dealing with doubters and the open-minded under circumstances more favorable than when years ago he broached his radical proposition; and, by way of completely substantiating his early contentions, he submits to the readers of this journal the fascinating story of the development of a unique non-sulphur vulcanizing agent that for all-around efficiency and proved practicality must rank with the most notable achievements in rubber technology.

Saving a Situation Sanely

TAKING the bull by the horns, the new administration of the United States Rubber Co. has decided to carry into effect a long-deferred rearrangement of its manufacturing operations. It takes courage to lop off costly deadwood and make radical changes in management, but those now in control have the firmness and sagacity needed for putting the great corporation on a sounder basis. It might indeed have been a serious matter for the entire American rubber industry had the affairs of so important a concern been allowed to drift much farther along uneconomic paths; and certainly it is more gratifying to find a wholesome house-cleaning being made at this time from within by those who are most competent and who have the stockholders' interests wholly at heart, than to incur the risk through dilatory tactics of a more drastic overhauling by less qualified and less sympathetic interests. A situation that occasioned much anxiety is being sanely saved.

RUBBER CLINICAL MODELS OF HUMAN ORGANS HAVE been described in this journal, but now comes a Halifax doctor with a pulsating Pará rubber replacement for a live cat's heart. Most adaptable of all materials! Perhaps in another generation with "heart of ham" rubber the timid may be emboldened, the heartless get hearts that will also be kind, sued philanderers may offer whole hearts for broken ones, or even benzol cement instead of cash for heart balm. Even hearty receptions may have more bounce than cordiality.

What the Rubber Chemists Are Doing

Lead Compounds Used in Rubber[1]

J. R. SHEPPARD[2]

THE attention of the reader is called to the practical importance to the rubber compounder of litharge and other lead compounds and more particularly to the vulcanization results obtained with litharges of different degrees of fineness.

In comparing sublimed litharge with the usual milled grade, it should be noticed that the photograph of the former is shown at 10 times the magnification of the latter. Similarly with the difference in the scales of the two charts of particle-size distribution for milled and sublimed litharge. These quantitatively demonstrate what the photographs indicate, namely, the vastly superior fineness of the sublimed grade.

Basic Lead Carbonate

Basic lead carbonate, or white lead, probably the most widely used and successful basic paint pigment, is also employed in rubber though not so generally as in paint. However, in rubber the basic carbonate is used otherwise than as a white pigment for, in common with most other lead compounds, it forms some lead sulphide during vulcanization, which destroys the white color. Although less powerful than litharge, white lead is used chiefly for its accelerating action. Its mechanism has not been followed with the same detail as in the case of litharge, but the accelerating effect is no doubt attributable to the basic part of the white lead molecule, $(PbCO_3)_2.Pb(OH)_2$. In addition, there is a reenforcing action; and as reenforcement and acceleration separately promote a stiffening and toughening of the stock, the net effect is the same when both functions operate.

Basic Lead Sulphate

Basic lead sulphate, or as it is known in the trade "sublimed white lead," is used for the same two functions, namely, acceleration and reenforcement, and here also the former function may be attributed to the basic part of the molecule $(PbSO_4)_3.PbO$. The resultant effect of sublimed white lead is that of stiffening and toughening the stock although, as in the case of other similar cases, it is difficult to analyze the observable result into its two separate components. More use is made of sublimed white lead than of the basic carbonate in rubber compounding. In fact, the basic sulphate is used in large amounts, particularly in certain kinds of press-cured goods, for example in solid tires.

Super-sublimed white lead is a basic sulphate similar to the ordinary sublimed product and behaves in rubber in much the same way as the latter.

Litharge

Litharge, however, is by far the most important lead compound as a rubber ingredient and functions solely as an accelerator, either by itself or in combination with other accelerators. Today a great many accelerators of vulcanization, mostly organic, are known and of these probably a hundred are in actual use. In the course of the last ten or fifteen years there has been an increase in the amount of organic accelerators consumed, at the expense of litharge; but this tendency to replace litharge with organic accelerators has slowed up a little, due to the fact that, while the organics have proven very useful, it is being found that, in the wide range of rubber products manufactured and in the wide range of stocks therefore called for, there is need for a corresponding range of curing conditions and of curing agents, and litharge is finding its place in this new alignment. As it happens, litharge is afflicted with a familiarity that dates from the first rubber to be vulcanized and, as time has gone on and new facts have been discovered about vulcanization, there has been little chance to strengthen the position of litharge. The discovery of competitive materials has had the expected result of reducing the importance of litharge in the process of vulcanization.

Litharge and Organic Accelerators

It might not be out of place to review briefly some elements which are considered in the choice of accelerators, particularly as they apply to litharge. First of all, because of lead sulphide formation, litharge is not used for white goods. This, however, does not interfere with the use of litharge in comparatively dark-colored products such as tan or brown heels, soles and footwear stocks. When used in stocks of this kind, with the proper amount of red pigment, the lead sulphide formation is no more than enough to produce a very attractive tan or chocolate color—in fact, it sometimes has to be augmented with small quantities of carbon black.

It is in the rubber footwear and mechanical goods branches of the industry that litharge finds its greatest present-day application. One reason for this is perhaps the high compatibility of litharge with diluents such as reclaimed rubber, factice, and mineral rubber, and with extremely fine-grained reenforcing agents such as carbon black or colloidal clay. While organic accelerators differ among themselves widely in their compatibility toward other compounding ingredients, in general they are less effective in the presence of the kind of diluents and of reenforcers that we have named. Certain accelerators, while giving remarkable results with rubber itself, are rendered useless by reclaimed rubber and similar diluents and softeners, and these materials are used very widely in the industry.

Compatibility, therefore, is a circumstance which the compounder must regard carefully. It undoubtedly is a consideration favorable to the retention of litharge for some uses. Interference on the part of finely subdivided reenforcers with acceleration is attributed to adsorption of the accelerator or of important reaction products by the large specific surface of the particles.

Litharge is capable of being used over a large range of curing temperatures, although it does not function well at extremely low temperatures. When it is desired to use the latter, for example from 230° F. down, it is advisable to use an organic accelerator which is effective at such low temperatures. Within the range of 242° F. to 332° F., which latter may be taken as about the upper limit of temperatures used commercially, the rate of vulcanization with litharge doubles for about every 13° F. rise in temperature. The rate of cure-temperature relationship is therefore a logarithmic one. In recent work based on various physical criteria of cure we have found for the above range values varying from 12.6 to 13.7 for the number of degrees F. which halve or double the rate of cure.

Dry heat curing, or vulcanizing in contact with hot air, presents somewhat different problems from closed mold vulcanization. In the former case there is the possibility, absent in the latter, of volatilizing the accelerator. For this reason the compounder never assumes dry heat from mold results, and he finds many accelerators which are much less effective in dry heats than in mold cures, and for this reason these are not suited to dry heats. This is a factor of importance in the rubber footwear branch. It may be said that litharge is eminently satisfactory in dry heats and has been for years the standard accelerator for dry-heat-cured rubber footwear. Even sulphur is lost appreciably through volatilization in dry heat curing.

A feature of litharge curing is the exothermal effect, of special advantage in the curing of thick objects where heat conduction into the interior is difficult. We have in this case the very conditions which enable the heat of reaction of the litharge to be

[1] "Rubber, With Special Reference to the Use of Lead Compounds," Vol. XX of the *Trans. Am. Inst. Chem. Eng.*

[2] Director of Research, Eagle-Picher Lead Co., Joplin, Mo.

retained and to compensate for the deficiency of heat resulting from slow conduction from the outside. This effect has been known for a long time and has even been cited[3] as the chief reason for the activity of litharge as an accelerator, though the polysulphide theory furnishes a more adequate mechanism.

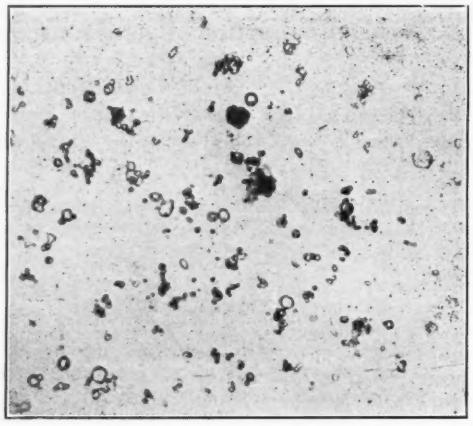


Fig. 1.—Milled Litharge (x 200)

Costs are, of course, important in the choice of an accelerator. The organic compounds cost from about 15 cents to $5 a pound, litharge 8 to 9 cents a pound; on the other hand, the organics are usable in the smaller doses, typical amounts being from a fraction of a per cent to 6 or 7 per cent of the rubber, while litharge is used in amounts varying from about 5 to 40 per cent. With such wide variations in cost and dosage between the various accelerators no general rule can be laid down—each case receives individual study.

A factor influencing cost is the necessity of using zinc oxide or other metallic oxide with many accelerators. This is true of most organics and has been adequately explained by Bedford and Sebrell[4]: in general, it is a case of the oxide and accelerator forming a salt which, after subsequent reactions, forms a polysulphide, which is the ultimate accelerator. The nominal accelerator therefore is frequently several steps removed from being the ultimate one and is no more the true accelerator than any of the other raw materials necessary in the chain of reactions leading up to the

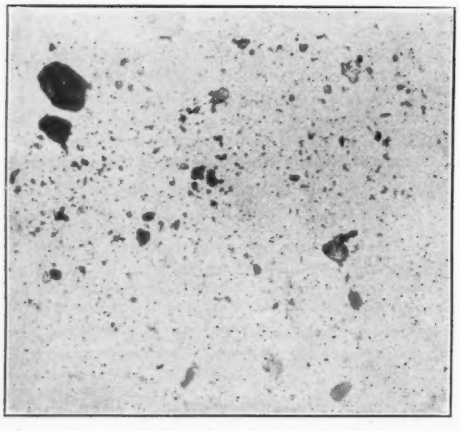


Fig. 2—Sublimed Litharge (x 2000)

formation of the polysulphide. It is, therefore, by way rather of convenience than of accurate description that various organic compounds, and litharge itself for that matter, are termed "accelerators."

[3]W. Esch, *Le Caoutch.*, 3, 449 (1906).

[4]C. W. Bedford and L. B. Sebrell, *J. I. E. C.*, 13, 1034 (1921), and 14, 25 (1922).

Litharge, while requiring no activator or auxiliary material other than organic acid naturally present in the crude rubber, is itself an activator for many organic accelerators, functioning like zinc oxide. In certain cases litharge is preferred to zinc oxide as an activator and is recommended by the accelerator manufacturers. For instance, among accelerators particularly adapted to litharge activation are the oxidized lead salt of dimethyl-dithio-carbamic acid which with litharge is a very active accelerator, useful for curing footwear stocks in dry heat, and mercaptobenzothiazole. The whole question of metallic oxide activators for organic accelerators is one which could stand more investigation and one on which the lead industry should concentrate.

Sublimed Litharge and Milled Litharge

In view of differences in particle size and crystal form, it might be asked whether different grades of litharge are identical in their vulcanizing effect. The data we have so far accumulated, chiefly on grades as distinct in physical characteristics as sublimed litharge and a typical milled grade, tend to show that particle size very distinctly affects vulcanizing properties.

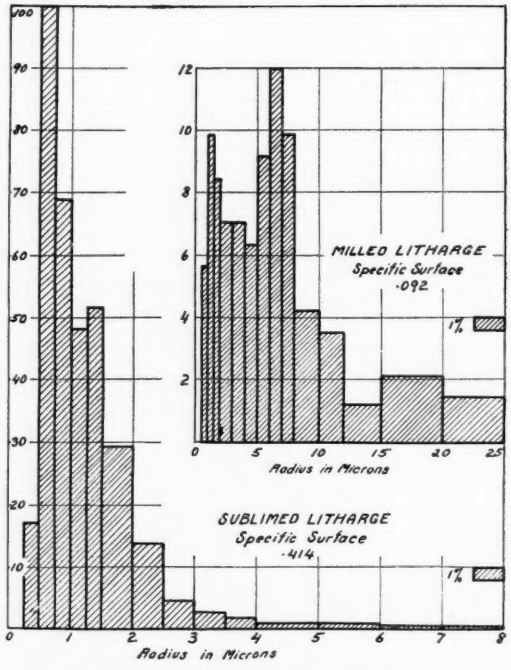


Fig. 3.—Particle-Size Distribution Curves for Milled and Sublimed Litharge

Litharge may be made in various ways, chief among which are processes of oxidizing metallic lead as, for example, by the mechanical rabbling of molten lead in a reverberatory furnace in an oxidizing atmosphere, or by subjecting molten lead in a furnace to a blast of air which oxidizes the surface and which in turn blows the freshly formed litharge over to one side of the kettle whence it escapes. Processes of this sort result in a litharge requiring grinding. The ultimate particle size, therefore, is whatever can be attained by disintegration and air separation. Reduction by these means reaches a limit which it is not feasible to exceed—the finer the particles the more difficult is further reduction.

To get extremely fine litharge is a question not of grinding, but of generating particles of the fineness desired at the start. This is accomplished in the sublimed litharge process which causes molten lead, compressed air, and fuel gas to issue in concentric circles with the lead in the center from an atomizer-burner of patented design. With this burner the lead is first of all atomized by the air, then vaporized in the heat of the flame issuing from the burner, almost instantaneously, however, to be oxidized to litharge vapor. This in turn quickly condenses to a white fume of extremely small liquid droplets, which in turn soon solidify. The

TABLE 1

Formulas	3E6	3E7
Smoked sheet	100	100
Sulphur	8	8
Zinc oxide	100	100
Milled litharge	20	...
Sublimed litharge	...	20

Formula No.	Litharge	Cure 287° F. in Mold, Minutes	Tensile at Elongation of 300	Tensile at Elongation of 500	Tensile at Break	Per Cent Elongation	Tensile Product	Energy Capacity
3E6	Milled	15	580	1,800	2,330	560	130	348
3E6	Milled	30	710	1,995	2,775	580	161	447
3E6	Milled	45	727	2,057	2,560	570	146	409
3E7	Sublimed	15	645	2,067	3,200	600	192	492
3E7	Sublimed	30	797	2,205	2,855	560	160	442
3E7	Sublimed	45	915	2,317	3,055	570	174	505

Data of this table by H. A. Braendle.

TABLE 2

Formulas	3E1	3E2
Smoked sheet	100	100
Sulphur	8	8
Zinc oxide	100	100
Stearic acid	1	1
Milled litharge	20	...
Sublimed litharge	...	20

Formula No.	Litharge	Cure 287° F. in Mold, Minutes	Tensile at Elongation of 100	200	300	400	500	600	Tensile at Break	Per Cent Elongation	Tensile Product	Energy Capacity
3E1	Milled	12	141	258	447	777	1,295	2,000	2,118	615	131	352
3E1	Milled	20	185	415	711	1,148	1,912	...	2,680	591	158	459
3E1	Milled	38	233	467	777	1,203	1,897	...	2,365	545	129	382
3E2	Sublimed.	12	151	327	579	931	1,610	2,390	2,516	620	156	440
3E2	Sublimed.	20	269	525	822	1,376	2,210	...	2,929	581	170	515
3E2	Sublimed.	38	264	579	848	1,403	2,260	...	2,565	535	137	422

The data for the 20-minute cure are the mean of two determinations.

TABLE 3

Formula No.	Litharge	Cure 287° F. in Open Steam	Tensile at Elongation of 100	200	300	400	500	600	Tensile at Break	Per Cent Elongation	Tensile Product	Energy Capacity
3E1	Milled	12 min.—wrapped	155	258	364	646	1,060	.....	1,395	580	81	242
3E2	Sublimed	12 min.—wrapped	147	246	441	810	1,325	.....	1,595	550	88	253
3E1*	Milled	20 min.—wrapped	95	190	333	572	1,000	.....	1,405	590	83	231
3E2*	Sublimed	20 min.—wrapped	138	252	435	755	1,259	2,015	2,015	600	121	321

*Irregularities in cured slab made it necessary to test these pieces across the grain, instead of with, as customary.

fume is carried through a cooling system and caught in bags.

Figures 1 and 2 show photomicrographs of a typical milled litharge and of sublimed litharge respectively, and Figure 3 shows particle-size distribution graphs on the same two products. The largest particles in an average microscopic field of the milled grade would pretty well cover the entire field of view if magnified equally with the sublimed. The latter is the finest litharge made.

While our study of the relationship of curing activity to particle size is as yet in a preliminary stage, the data already obtained show advantage in the finer product. Tables 1 to 3 show data on rubber stocks compounded with milled and sublimed litharge respectively. The formulas and the cures, the latter involving both mold and open steam cures, are given in the tables.

Quite consistently higher properties for the sublimed than for the milled grade are shown when the same cures are compared. In particular the greater stiffness of the sublimed stocks should be noted as exhibited by the tensile at a given elongation. These results suggest that the rubber compounder can effect an economy by replacing a given quantity of milled litharge by a smaller amount of the sublimed litharge.

"Novex"

Chemically, "Novex" is benzal bis-dimethyl-dithiocarbamate. Its melting point is about 175° C. and specific gravity 1.365. The material is a fine white crystalline powder without appreciable odor. It mills readily into rubber and does not bloom to the surface of uncured stock. Extensive investigation has revealed that it has no toxic action on workers. Its accelerating action is not retarded by carbon black, clay, antimony sulphide, pine tar, rosin, hardwood pitch, or stearic acid. In fact, "Novex" gives stronger stocks when acidic softeners are employed.

It may be used in economical vulcanization at as low as 20 pounds' steam pressure, 258° F., and is suitable for goods of any color. It does not give cured stocks of as high modulus as Dotg or Monex but more like those given by Trimene Base or Captax. Its recommended applications are low temperature curing tires, clothing, footwear, heavily loaded compounds, and druggists' sundries.

Recovering Used Rubber

Used rubber is recovered by boiling it with an ester, as an acetate, butyrate, or formate of an alcohol, such as cyclohexanol, or an ether such as benzyloxy-amyl- or butyl-cineole, and filtering the product. Recovery of the ether is effected by washing it with a solvent such as ethyl alcohol.

Vulcanite Radio Cone

Radio loud speaker cones made of fiber are liable, if not exceptionally well made, to absorb moisture and thus lose their essential tautness or in warmth to dry out and crack, especially at the seams. A new vulcanite cone being marketed in Europe is said to overcome these potential defects and to be acoustically more efficient. It is formed of a fine linen duck thinly coated with a hard rubber compound. In order to save the fabric from being damaged by heat, the curing time for the molded cone is limited to five minutes, such brief vulcanization being made possible by using a suitable accelerator.

Accelerator 833

Accelerator 833 is a new low-temperature accelerator particularly suited for the vulcanization of boots and shoes. It gives a dry surface after cure, a very long range of cure, and exceptional aging properties to the stock. It has about double the activity of Vulcanol or Accelerator 808. No other aldehyde-amine accelerator has so low a critical temperature and so little discoloring effect as 833. Combinations of Accelerator 833 and Thionex have a lower critical temperature than either of these accelerators singly and can be handled without difficulty under favorable processing conditions in fast-curing shoe stocks.

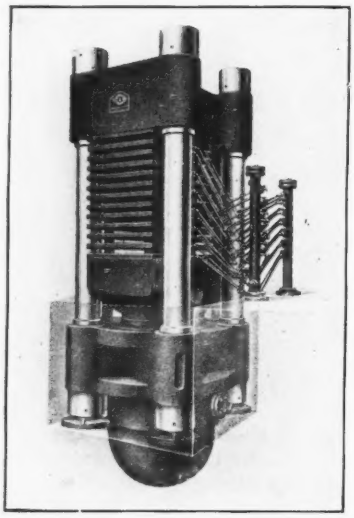
S. A. E. Summer Meeting

The Society of Automotive Engineers will conduct its summer meeting technical program at Saranac Inn, Saranac Lake, N. Y., during the days of June 25 to 28 inclusive. The sessions are scheduled as follows: Business of Engineering, June 25; Combustion, Motor-truck Design, and Dinner, June 26; Mixture-Distribution, Transportation, and Airship, June 27; and Research, June 28.

Petition Against Proposed Changes in Diversion Rules

Anderson-Prichard Oil Corp., Oklahoma City, Okla., has inaugurated a campaign against the proposed changes in diversion rules. In a letter signed by C. H. Dresser, director in charge of industrial naphtha sales, the company calls attention to the fact that the National Diversion and Reconsignment Committee under its Docket No. 487 contemplates the modification of Note 3 to Rule 14 relating to diversion and reconsignment of petroleum and its products by placing a time limit within which the shipments must be diverted, in order to obtain protection on the through rate. The letter explains just how this will affect the trade and concludes with an appeal to write a letter of protest to the members of the committee. The names and addresses of the members of the committee and a suggested letter are added.

New Machines and Appliances



German Hydraulic Press

Multiple Deck Vulcanizing Press

AN extremely heavily built hydraulic press of German manufacture is here illustrated. It has 12 openings and is equipped with a system of swing-joint piping supplying steam to the platens from vertical manifolds set at the edge of the press pit. The press is designed with a factor of safety of six and it is well finished in all its parts.

The cylinders are Siemens-Martin annealed steel castings. The water-supply connections are easily accessible and sediment is avoided in the cylinders. Renewal of the packing is possible, without dismounting the press, by an ingenious arrangement. The rams are of special close-grained iron, ground, highly polished, and accurately fitted in the cylinders. The press table is extra heavy to prevent deflection under working strain. The supporting columns are special Siemens-Martin wrought steel and the cap nuts are of the same material accurately fitted.

The steam platens are guided on the press columns and are made from a special alloy of high conductivity. The plate thickness is reduced to a minimum owing to the very high compressive strength of the steel used. Each platen is piped independently for steam.

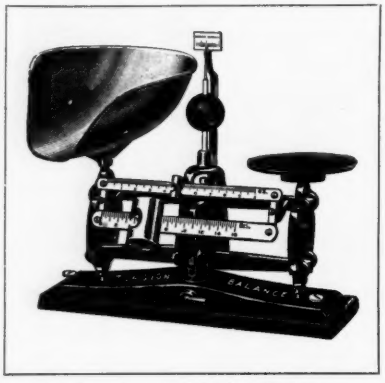
The heating canals are bored by special machinery and their arrangement is such that uniform heating of the press surface is obtained.

The quick closing arrangement for the operation of the press comprises a small high-pressure press pump acting on an auxiliary cylinder located between the main cylinders of the press. The auxiliary cylinder raises the press table as well as the ram and plates. The press is closed in about 20 to 30 seconds. The large press rams are attached to the press table and thus rise at the same time. The space which is thereby made in the press cylinder is filled with water, not under pressure, flowing from an elevated tank.

High pressure is supplied by a valve which conducts the high-pressure water of the press pump to the main press cylinders.—G. Siempelkamp & Co., Krefeld, Germany.

Compounder's Balance

THE illustration represents a sensitive balance well suited for rubber compounders' use in weighing out powdered accelerators, dry colors, and other ingredients that require to be closely



Accelerator and Color Balance

weighed for carefully balanced mixings. It has a capacity of one pound (500 gr.) and is sensitive to one grain (1-15 gr.). It is an even balance scale of the well-known torsion type which gives it special sensitivity. The upper beam is graduated one ounce by single hundredths or if specified, 10 gr. by 1-10 gr., and the lower beam 16 ounces by ¼ ounces, or if specified, 500 gr., by 5 gr. Alternatively, however, they may be graduated metrically. There is an arrest for quick weighing. The scoop is of brass 8 by 11¾ by 3 inches, and the scale in general is finished in black Japan.—The Torsion Balance Co., 92 Reade St., New York, N. Y.

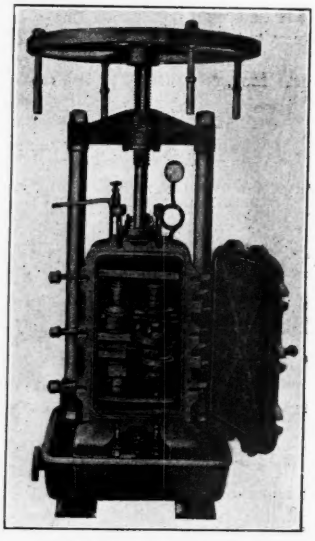
Hand Press-Autoclave

THE radically unique piece of vulcanizing equipment here pictured is of Belgian design and manufacture. It is however, worthy of consideration here as an item both for laboratory and small-works operation. It is essentially a hand-screw knock press by which rubber can be compressed while contained in curing molds stocked within a steam chamber or autoclave.

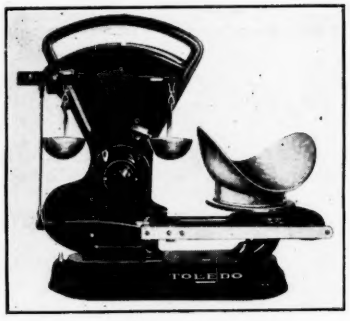
The construction of this piece of equipment is at once simple and rugged. The press has a heavy cast-iron base raised on broad square feet which rest on the mill floor. The base is cast in rectangular basin-form to receive the drip from the autoclave and conduct it away through a discharge outlet. The autoclave itself is a heavy cast box-like steam chamber with a hinged door which can be bolted steam-tight against a rubber gasket joint, using for this purpose ten hinged bolts engaging heavy lugs cast integral with autoclave and door. The press screw is threaded through a heavy yolk spanning two holding-down steel-rod posts shouldered at the yolk and autoclave base and secured with powerful nuts. The press operating wheel is of heavy fly-wheel type with downwardly projecting grips giving secure handhold. These facilitate the exertion of intense pressure against the molds by the platen as it is forced downward.

This press-autoclave effectually solves the need of small rubber manufacturers for a hand-operated pressure vulcanizer. The apparatus can be used with molds of the same or variable thickness. They may be of every variety of thickness, yet all be heated under pressure in the autoclave at one time as pictured in the accompanying illustration. Gage and hand-control only are indicated in the illustration, but automatic control might easily be applied. Provision is made to discharge through the bottom of the autoclave any condensation that takes place during the cure.

While the apparatus was designed for the use of small manufacturing plants in need of this type of vulcanizer, it would



"Belgica" Press-Autoclave



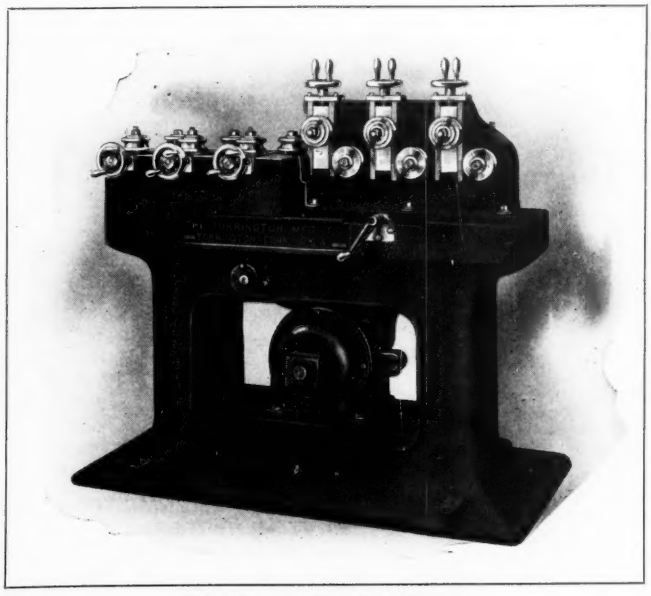
Toledo Counting Scale

serve equally well for laboratory use. It is not expensive, occupies but little floor area, is easily installed, easily operated, accommodates molds of all thicknesses, and affords vulcanization under pressure in an atmosphere of steam.—Sevrin & Migeot, Auvelais, Belgium.

Rod and Tube Straightener

THE problem of keeping straight the rods and light poles used for the manufacture of pressure tubing and small hose often goes unsolved in many rubber plants greatly to the increase in the cost of production of such goods, to say nothing of the depreciation in quality that may result.

While the interest of the rubber hose manufacturer is confined only to rods and poles of circular section, the illustration pictures a machine designed to straighten rods and tubes of any section, whether in rounds, squares, hexagons, or special shapes.



Torrington Pole Straightener

The straightening of such rods is effected by passing the metal through grooved rolls, all driven, in staggered arrangement in each of two planes. The operation is rapid and requires a minimum of attention by the operator when the rolls are set. The rolls are of crucible machinery steel with grooving accurately sized for desired size. They are provided with outboard supports for extreme ruggedness. One half the rolls in each plane are adjustable by hand wheels.

The machines are built for either belt or motor drive. Motors are located within the pedestals of the smaller machines and on bed plate extension on the larger. The units are thus entirely self-contained and floor space is conserved. All the gearing is cut from solid stock and is fully guarded. The bearings throughout are of bronze with ample and accessible lubrication facilities.—The Torrington Mfg. Co., Torrington, Conn.

The story of how Dr. Ostromislensky vulcanized rubber without sulphur is on page 55 of this issue.

Scale for Counting Small Articles by Weight

PRACTICALLY every division of the rubber manufacturing industry has routine use for a counting scale. Among these uses are cost estimating, checking incoming shipments, disbursement, production, and inventory of all descriptions of small items such as small molded articles.

A rapid and accurately working scale specially designed for counting articles is here pictured. It combines extreme sensitivity and accuracy combined with automatic dial indication, and will count the very smallest parts in any quantity up to a total of 40 pounds. In its operation no poises or weights are handled. The scale is fully automatic, quick, accurate, and easy to use.

The scale is of the bench type, small and compact. Pendulum and self-alining bearings are employed. Fastened to the end of the extended ratio beam is a rod hooked to an auxiliary lever, from which two cup-shaped ratio pans are suspended. The right-hand pan has a ratio of 99 to 1, that is, with a balance when 1 part is in the right-hand pan, the count is 100. The left-hand pan has a ratio of 9 to 1, which means that one part in this pan counts 10 parts.

To count an unknown quantity, all the parts are put in the platform scoop. Parts taken from the scoop are now placed in the right-hand ratio pan until the indicator approaches zero. Then parts are put into the left-hand pan until the indicator touches zero. If the count is still not accurate, that is, if the indicator does not split zero, counting the odd parts out into the hand will give the number.

To arrive at a predetermined number, the procedure is to place the hundreds and tens numbers in the ratio pans and fill the platform scoop until the scale is balanced. That is, for 453 parts, four parts would go into the right-hand ratio pan, five into the left-hand or 9 to 1 pan, and then, after balancing, three parts would have to be added.—Toledo Scale Co., Toledo, O.

Tire Balancing Machine

THE perfect balancing of revolving units so desirable in all machinery is vitally essential in fly-wheels and automobile wheels. The deviation from perfect balance in an automobile wheel is in part due to variations in the tire carcass. This, is so important a feature that it has attracted the serious attention of automotive engineers, one of whom has invented the device here illustrated for testing the balance of automobile engine fly-wheels and other revolving parts.

This machine, known as the "Micro-Poise" tire balancing machine, has many novel features and is extremely accurate. It is mounted on a substantial base and is easy and fast to operate. The wearing parts are readily renewed at small expense.

In operation the tire is placed on the center flange which is expansible and centers the tire with exactness. By movement of the small lever at the right of the center of the instrument the tire is freed on the balance device. The tire then tips toward its heavy side which is at once indicated by the universal level, the round disk of which is nearest the operative and may be seen in the foreground of the picture. The center beam is then moved in position to correspond with the bubble in the level and the amount of the unbalance is weighed, the pointer showing the exact center of the heavy side of the tire.

Other devices are in use for measuring unbalance in tires, but the device here described is believed to be of superior merit.—Utility Manufacturing Co., Cudahy, Wis.

Micro-Poise Machine

Editor's Book Table

Book Reviews

"The Pyrolysis of Carbon Compounds." By Charles Dewitt Hurd. The Chemical Catalog Co., Inc., 419 Fourth Ave., New York, N. Y., 1929. Cloth, 807 pp. 6 by 9 inches. Indexed.

This volume is an American Chemical Society monograph. The subject of Pyrolysis is covered in 29 chapters. Citing only the rubber references, isoprene and other products of the destructive distillation of rubber are discussed in the chapter on petroleum, rubber, and related hydrocarbons. In the chapter on polymerizations and depolymerizations, methods for the production of isoprene are outlined. Also the conversion of isoprene into synthetic rubber is considered with data and references to work on the subject.

The volume is one of great value to the organic chemist engaged in research in very many lines besides rubber.

"Commodity Exchanges." By Julius B. Baer and George P. Woodruff. Harper & Brothers, New York and London, 1929. Cloth. 319 pages, 5½ by 8½ inches. Indexed. Illustrated.

This book supplies complete descriptions of every phase of the operation of commodity exchanges, and their place in the commercial world. The factors common to the various exchanges—rubber, silk, cotton, grain, metal—the ways in which they differ, and the advantages they offer to all individuals dealing in these commodities, are explained very simply and clearly.

Describing the evolution of the modern exchange, the authors explain the workings of the futures contract and the difference between the cash and futures markets. The government, organization, and internal machinery of exchanges and their allied institutions, clearing associations, are considered, together with methods of trading on the exchange floor. Here are told the ways of facilitating buying and selling, stabilization of prices, prevention of corners and squeezes, basis contracts, use of warehouse receipts in trading, and the other advantages which commodity exchanges offer.

The hedge, of paramount importance to dealer, manufacturer, warehouse, large producer, as a means of price insurance, is next considered, in a way which shows how the hedge can be used to remove business from the range of speculation to a sound merchandising basis. It is illustrated by practical problems.

The book closes with a description of the legal phases of the subject, court rulings, present status of government regulation, etc. The emphasis throughout is on the value of the exchange to the various individuals who at one point or another, have to do with commodities. These will find the book a manual of definite value.

New Publications

"Yarway Floatless Hi-Lo Alarm Water Column and Se-Sure Inclined Water Gage" is an attractive and profusely illustrated catalog issued by Yarnell-Waring Co., Philadelphia, Pa. Its twenty-four pages are devoted to illustrated descriptions of the Yarway water columns and gages, important safety devices. Paper, 6 by 9 inches.

A. Schrader's Son, Inc., valve and gage manufacturer, Brooklyn, N. Y., has recently issued a new, twelve-page catalog in two colors, containing prices and pictures of eighty of the six thousand items it manufactures. The catalog is supplemented with a new Schrader Valve Practice Chart containing standard valve practice as approved by The Tire & Rim Association.

"Packing and Gaskets, Rubber (Molded, Sheet, and Strip)" is United States Government Master Specification No. 111b, issued by the Department of Commerce, Bureau of Standards, United States Government Printing Office, Washington, D. C. It contains the revision promulgated by the Federal Specifications Board on December 8, 1928, and supersedes F. S. B. No. 111a and B. S. Circular No. 235. Paper, 6 pages. 5¾ by 9⅛ inches.

"Stedman Tile of Reinforced Rubber" is the latest catalog issued by Stedman Products Co., South Braintree, Mass. In its 16 pages it gives a brief account of Stedman tile, the original reinforced rubber floor, and also Stedman accessories. The booklet boasts many attractive illustrations with several of the floor designs in colors. Paper, 8½ by 11 inches.

"La Goma" is a new magazine published monthly in Barcelona, Spain, for the rubber industry. The periodical deals with gutta percha, insulated wire, ebonite, celluloid, and other plastic materials, and also their derivatives and applications. Juan Blanch Guerrero is editor and publisher.

"NTDA Collection Service" is a booklet issued by the National Tire Dealers' Association, Inc., 220 Weiner Arcade, 36 S. Howard St., Akron, O. It contains the association's "Contract and Plan of Operation with The Credit Clearing House Adjustment Corporation for Collection of Claims." Paper, 16 pages. 6 by 9 inches.

In a letter signed by C. A. Meyer, managing director of the association, to members, the purpose is given as follows. "Keeping apace with the scientific developments in Trade Association practice your Officers and Directors have entered into an Agreement with The Credit Clearing House Adjustment Corporation whereby it becomes the official collection and adjustment medium of the NTDA."

"British Colonial Office Reports on the Rubber Situation," Trade Information Bulletin No. 603, published by the Department of Commerce, Bureau of Foreign and Domestic Commerce, United States Government Printing Office, Washington, D. C., was compiled by E. G. Holt, Chief, Rubber Division. This 40-page paper booklet contains the original report of the Colonial Office (Stevenson) Committee, issued in May, 1922; the supplemental report of the Colonial Office Committee, issued in October, 1922; the edited statement of the Colonial Secretary in the House of Commons in April, 1928; and the report of the Undersecretary of State for the Colonies, issued in December, 1928.

"Visitors' Manual of the National Bureau of Standards" is a pamphlet, Miscellaneous Publication No. 93, issued by the Department of Commerce, Bureau of Standards, United States Government Printing Office, Washington, D. C. It was prepared by Hugh G. Boutell, Chief, Information Section, and lists as its contents: History, functions, and organization; Points of interest; A few outstanding accomplishments; Volume of testing; Airplane view of the Bureau of Standards; and two diagrams. Paper, 16 pages. 3½ by 7¾ inches.

"1929 Year Book" has recently been issued by The Tire & Rim Association, Inc., 1401 Guarantee Title Building, Cleveland, O. This new book is a complete revision, the size being changed to 8½ by 11 inches and much new material included, some twenty pages being devoted to European standards. The 94 pages contain a fund of information, including tables, charts, and diagrams. The thumb-index facilitates locating the different sections on rim contours, loads and inflations, airplane tires, rims for truck tires, solids, valves, tire and rim equipment. The appendix contains European data on contours, loads, and inflations.

"Skid Platforms." This pamphlet of 18 pages is "Simplified Practice Recommendation R 95-28" issued by Department of Commerce, Bureau of Standards. The recommendation refers to clearance dimensions as follows: Clear height from bottom of runners or other supports to underside of platform, 8 to 12 inches. Minimum horizontal distance between inside of runners or other supports, 29 inches.

"Commercial Standards Monthly," May 15, 1929, No. 50, issued by the United States Department of Commerce, Bureau of Standards, Washington, D. C., contains the following important notice:

"For four years the Division of Simplified Practice of the Bureau of Standards has issued a monthly bulletin on the progress of simplification and commercial standardization. This publication summarizes the projects under consideration, meetings held, and, wherever possible, the work being done by the individual concerns and non-governmental groups.

"Plans have now been made for increasing both the size and scope of the bulletin and for printing it as a magazine on a subscription basis. The price will be $1 a year, payable in advance, to the Superintendent of Documents, Government Printing Office, Washington, D. C. The June, 1929, issue will be the last to appear in the present form."

"A List of the Books, Bulletins, Journal Contributions, and Patents By Members of Mellon Institute of Industrial Research During the Calendar Year 1928" is the title of Bibliographic Series Second Supplement to Bulletin No. 2 issued by Mellon Institute of Research, Pittsburgh, Pa. This pamphlet lists 1 book, 14 bulletins, 15 research reports, 104 other scientific and technical papers, and 25 United States patents published in 1928.

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Rubber Questionnaire

First Quarter 1929*

Reclaimed Rubber	Long Tons: Inventory at End of Quarter	Production	Shipments	Consumption
Reclaimers solely (9)	4,787	22,516	23,431	5
Manufacturers who also reclaim (24)	7,564	31,036	10,807	26,240
Other manufacturers (81)	5,376	....	....	17,643
Totals	17,727	53,552	34,238	43,888

Scrap Rubber	Long Tons: Inventory	Consumption	Due on Contract
Reclaimers solely (9)	20,997	29,455	17,216
Manufacturers who also reclaim (21)	36,710	41,546	20,322
Other manufacturers (14)	1,428	....	....
Totals	59,135	71,001	37,538

TONS OF RUBBER CONSUMED IN RUBBER PRODUCTS AND TOTAL SALES VALUE OF SHIPMENTS

Products	Crude Rubber Long Tons	Total Sales Value of Shipments of Manufactured Rubber Products
Tires and Tire Sundries:		
Automobile and motor truck pneumatic casings	82,268	$141,240,000
Automobile and motor truck pneumatic tubes	15,736	20,558,000
Motorcycle tires (casings and tubes)	189	318,000
Bicycle tires (single tubes, casings and tubes)	248	584,000
Aeroplane casings and tubes	27	147,000
Solid and cushion tires	2,209	4,253,000
All other solid tires	182	577,000
Tire sundries and repair materials	1,232	4,376,000
Totals	102,091	$172,053,000

Products	Crude Rubber Long Tons	Total Sales Value of Shipments of Manufactured Rubber Products
Other Rubber Products:		
Mechanical rubber goods	5,783	$28,835,000
Boots and shoes	3,827	20,986,000
Insulated wire and insulating compounds	1,071	8,199,000
Druggists' sundries, medical, surgical rubber goods	537	2,230,000
Stationers' rubber goods	355	682,000
Bathing apparel	284	653,000
Rubber clothing	283	1,362,000
Automobile fabrics	318	2,447,000
Other rubberized fabrics	452	1,739,000
Hard rubber goods	339	1,587,000
Heels and soles	1,535	5,774,000
Rubber flooring	257	892,000
Sporting goods, toys and novelties	429	1,578,000
Miscellaneous, not included in any of the above items	719	3,109,000
Totals	16,189	$80,073,000
Grand totals—all products	118,280	$252,126,000

INVENTORY OF RUBBER IN THE UNITED STATES AND AFLOAT

On Hand	Long Tons: Plantation	Para	All Other	Totals
Manufacturers	62,258	2,230	1,127	65,615
Importers and dealers	27,626	1,446	423	29,495
Totals on hand	89,884	3,676	1,550	95,110
Afloat				
Manufacturers	12,265	....	....	12,265
Importers and dealers	38,918	136	17	39,071
Totals afloat	51,183	136	17	51,336

*Number of rubber manufacturers that reported data was 169; crude rubber importers and dealers, 39; reclaimers (solely), 9; total daily average number of employes on basis of third week of January, 1929, was 158,971.

It is estimated that the reported grand total crude rubber consumption and the grand total sales value figures to be approximately 92 per cent; the grand total crude rubber inventory and afloat figures 95 per cent; the reclaimed rubber production 93 per cent, reclaimed consumption 73 per cent and reclaimed inventory 78 per cent of the total for the entire industry.

Compiled from statistics supplied by the Rubber Manufacturers Association, Inc.

Rubber Manufacturers Association

Statistics for First Three Months—1929

The Rubber Manufacturers Association has compiled the following estimates based on answers to its questionnaire, which have been raised to 100 per cent, covering operations in the rubber industry for the first three months of this year. All figures are estimated totals for the United States in the period under review.

The estimated amount of crude rubber consumed in the manufacture of all rubber products in the United States during the first quarter of 1929 was 128,565 tons, of which 110,960 tons were consumed in the manufacture of tires and tire sundries, including bicycle and airplane tires. Stocks of crude rubber on hand as of March 31, 1929, totaled 100,115 tons; while rubber afloat for United States ports as of March 31, 1929, totaled 54,038 tons.

The estimated total sales value of shipments of all rubber products manufactured in the United States amounted to $274,050,000, of which $187,014,000 represented the total sales value of shipments of tires and tire sundries, including bicycle and airplane tires. The production of reclaimed rubber was estimated at 57,582 tons, of which 60,113 tons were consumed in the United States during the first quarter of 1929.

Foreign Trade Information

For further information concerning the inquiries listed below address United States Department of Commerce, Bureau of Foreign and Domestic Commerce, Room 734, Custom House, New York, N. Y.

Number	Commodity	City and Country	Purchase or Agency
37,836	Tires	Tsinan, China	Both
37,874	Canvas shoes	Berlin, Germany	Agency
37,908	Tires	Tegucigalpa, Honduras	Both
37,912	Druggists' sundries and novelties	Montreal, Canada	Both
37,916	Druggists' sundries	Sofia, Bulgaria	Agency
37,926	Tires and tubes	Teheran, Persia	Agency
37,930	Soles	Frankfort, Germany	Agency
38,010	Rubber goods	Rosario, Argentina	Agency
38,011	Overshoes and snowshoes	Berlin, Germany	Agency
38,015	Shoes	Frankfort, Germany	Agency
38,034	Elastic braid	Frankfort, Germany	Purchase
38,049	Orthopedic rubber and infants' sanitary goods	Buenos Aires, Arg.	Agency
38,114	Tires and tubes	Plymouth, England	Agency
38,115	Railway brake gear parts	Johannesburg, S. A.	Purchase
38,144	Tires	Berlin, Germany	Agency
38,152	Carnival toys	Silberhuette, Germany	Agency
38,178	Bathing caps, shoes, snowshoes, hot water bottles, and balls	Prague, Czechoslovakia	Agency
38,210	Soap dishes, etc.	Vancouver, Canada	Purchase
38,211	Shoes	Berlin, Germany	Agency
38,218	Balloons	Madras, India	Agency
38,234	Transmission belts	Sao Paulo, Brazil	Purchase
38,258	Specialties	Constantinople, Turkey	Agency
38,308	Overshoes	Frankfort, Germany	Agency
38,309	Footwear	Copenhagen, Denmark	Agency
38,310	Overshoes	Offenbach, Germany	Agency
38,311	Pencil erasers	Glasgow, Scotland	Agency
38,312	Tennis balls, bathing caps, and specialty goods	Johannesburg, S. A.	Agency
38,313	Tires and tubes	Baghdad, Iraq.	Agency
38,314	Mineral rubber	London, England	Purchase
38,329	Tires	Addis Ababa, Ethiopia	Agency
38,333	Bathing caps, shoes, etc.	Naples, Italy	Agency
38,379	Pencil erasers and rubber bands	Manila, P. I.	Agency
38,391	Buttons	Melbourne, Australia	Purchase
38,404	Balloons	Glasgow, Scotland	Agency
38,449	Boots	Guatemala City, Guatemala	Purchase
38,450	Tires and tubes	Montevideo, Uruguay	Agency
38,451	Galoshes	Chemnitz, Germany	Agency
38,494	Tires	Hamburg, Germany	Both
38,514	Surgical goods	Lourenco Marques, Portuguese, E. A.	Purchase
38,533	Tires	Berlin, Germany	Agency
38,534	Sundries and specialties	Panama City, Panama	Agency
38,535	Sundries and specialties	Panama City, Panama	Agency

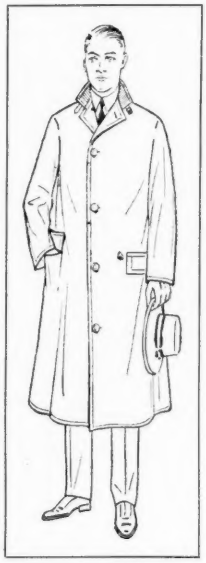
Foreign Trade Circulars

Special circulars containing foreign rubber trade information are now being published by the Rubber Division, Bureau of Foreign and Domestic Commerce, Washington, D. C.

Number	Special Circulars
2290	French Tire Exports, Month of February, 1929.
2292	French Footwear Exports, Month of February, 1929.
2294	British Exports of Footwear, February, 1929.
2295	British Exports of Automobile Casings, February, 1929.
2298	South African Market for Hose.
2299	Steady Market in Malaya for Footwear.
2300	Future Market for American Tires in Ethiopia.
2301	United States Consumption of Crude and Reclaimed Rubber During 1928.
2309	Final Reports of Dealers' Stock of Automobile Tires in the United States, April 1, 1929.
2310	Italian Tire Exports During Calendar Year 1928.
2311	Comparative Exports of Solid Tires from the United States, Canada, The United Kingdom, Germany, and Italy, Calendar Year, 1928.
2321	Mexican Tire Market for 1928.
2323	Canadian Tire Exports, Month of March 1929.
2324	Canadian Tire Exports, First Quarter of 1929.
2325	Canadian Footwear Exports, First Quarter of 1929.
2326	Canadian Exports of Belting and Hose, First Quarter of 1929.

New Goods and Specialties

Snappy Raincoat



Kidtex Slicker

A RAINCOAT is an essential in every man's wardrobe. A model that will surely please is the Kidtex slicker here illustrated. This coat is made of medium weight, plain service Kidtex fabric, with a lining to harmonize. It is single - breasted and square-shouldered, with a corduroy stand - up collar through the tabs of which is run a leather strap. The patch pockets have flaps and the sleeves have tabs. All seams are sewed, cemented, and strapped. The coat is made in varied lengths, 47 to 54 inches, and chest sizes 34 to 48. Another model is made of the same fabric, but with raglan shoulders, a convertible collar with corduroy stand, and slash pockets.—Clifton Mfg. Co., Jamaica Plain, Boston Mass.

Dolls with Rubber Arms and Legs

THE little girl of the present generation who delights in dolls is far more fortunate than were her grown-up sisters in the types of these toys offered for her pleasure. It must be confessed that the playthings made years ago were not nearly so natural or lifelike as the present-day variety. Especially attractive and realistic are the dolls manufactured by the Ideal Novelty & Toy Co., 273 Van Sinderen Ave., Brooklyn, N. Y. Three of the models are pictured below.

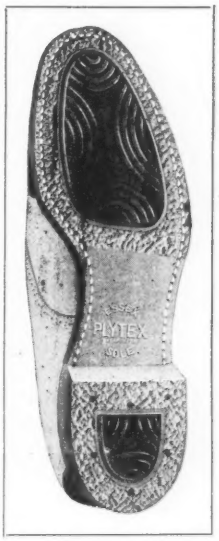
"Tickletoes" will tickle the heart of any young miss. The doll sleeps, clasps her hands, sucks her thumb, enjoys her pacifier, and wears rubber panties, just like baby sister. "Tickletoes" has live rubber arms and legs. Furthermore, when squeezed, she cries, for she has a voice in each leg as well as in her body. And please note her dainty little outfit. All Ideal dolls are exquisitely dressed in the latest fashion.

"Baby Smiles" duplicates nearly all the cute tricks of "Tickletoes." The arms are of flexible washable rubber. "Baby Smiles," like a majority of Ideal dolls, enjoys also a rubber pacifier.

Isn't "Cuddles" darling? She, too, has rubber arms and a pacifier. She sleeps and cries, sucks her thumb, and clasps her hands. All these dolls come in different models and sizes, although the characteristic qualities of each type are retained.

Sport Soles of Rubber

MEN and women who dress as fastidiously for play as for the day's more formal moments will want their shoes Plytex Soled. To match the varying colors of sport shoes, Plytex is offered in black, tan, neutral, and pure crepe—the colors contrasted in pleasing harmony.



Plytex Sole

Steady Tread soles and heels for both men's and women's shoes are other products of quality. There is something firm and strong about these soles and heels. Rubber cleats that grip the grass and turf, a sturdy sand blast finish—they fit so well the determination to play a better game. Furthermore, they give the wearer the appearance of a champion.—Essex Rubber Co., Trenton, N. J.

Playthings Made Partly of Rubber

"Tickletoes"

"Baby Smiles"

"Cuddles"

Modish Marine Millinery

THE SEAMLESS RUBBER CO., New Haven, Conn., offers a tempting array of bathing caps that is *le dernier crie* in beach fashions. Three especially attractive models are here illustrated.

SR 1243

SR1522

"Treasure Chest," SR 1295, is the popular aviator cap now displaying the design of a girl diving after a treasure chest at the bottom of the ocean. This cap may be

SR 1295

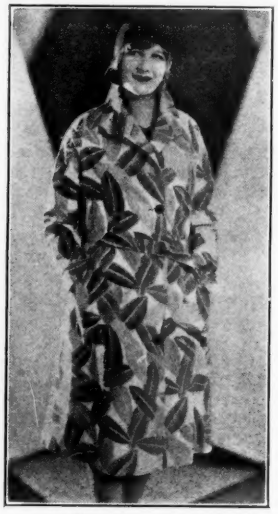
had in red, blue, green, black, and white.

The most original creation in years is "The Vagabond," SR 1243, a four-piece sport hat. This comes in white with black trimming. Another hat with a slightly different brim is made in assorted colors.

Another chic model is SR 1522. This close-fitting cap is relieved from severity by the large bow perched jauntily at a fetching angle near the top of the crown. Other smart models in assorted colors are also fashioned after the trim felts so popular for street wear.

Coat for Stormy Days or Beach Wear

FEMININE fashions are subject also to the whims of Jupiter Pluvius. But doubt arises as to whether any woman would object to rain or a "mere man" making her wear so smart a coat as the one here illustrated. It is a Parisian model made of light weight rubberized linen weave fabric with a modernistic leaf design developed in black and gray on a white background. The garment is fashioned with the nobby French collar, raglan sleeves, novelty patch pockets, and a double-ring belt all around. The linen is hand-blocked. This single-breasted coat has a moisture-proofed lining that makes it so serviceable for rainy days and beach wear. The collar is cut with a point in the back and fastens close about the neck, to prevent any danger of sunburn when the coat is donned at the beach. The garment comes in misses' sizes 14 to 20.—Harris Raincoat Co., 525 Seventh Ave., New York, N. Y.



New York Times Studios

Harris Raincoat

Stunning Ensembles for Milady at the Beach

EVERY so often something really new appears to gladden the heart of the feminine world. Now it is the newest and most unique creations for beach wear. The Para Seashore Togs—coolie coats, capes, bandannas, vanity bags, and kits—are made of rubberized, lustrous silks, two-toned moires, and satins. Modernistic is the word for these colorful creations skillfully decorated with Viennese designs.

The coolie coat comes in several models, of modernistic satin, of moire silk with contrasting moire trimming, or of plain silk with modernistic trimming. The coat in the illustration is made of plain silk with the modernistic trimming cemented on the collar, on the patch pocket, on the back, and again on the lower corners in front.

The cape has a large ruff that sets off so well the charm of the wearer. This wrap is made of modernistic satin, of moire silk, of plain silk with Viennese designs, and also of brocaded silk. Both the coat and cape are made in the many beautiful colors so popular with the fashionable world, either to match the bathing suit or in a striking contrast.

The smart bandanna is fashioned in all colors to match beach ensembles, in plain or moire silk, or modernistic satin. The style here pictured matches the cape in the group illustration.

The bags, which are shown in the group illustration, also are designed to complete the ensemble, in modernistic satin, or plain, moire, or brocaded silk. The bathing-suit bag, which has a zipper fastening, boasts of two compartments: one for the wet suit, and the other for the dry garments. The vanity bag is an important detail in the costume of the fair bather, for it is created to contain all the feminine foibles so necessary and dear to the female of the species. These chic models are products of the Para Rubber Co., 341 Halsey St., Newark, N. J.

The Para Seashore Togs

The Rubber Industry in America

OHIO

The Aetna Rubber Co., Cleveland, O., at its Ashtabula plant is manufacturing Aetna sheet rubber flooring in marbleized block design. This flooring is made 36 and 48 inches wide and is furnished in rolls 30 feet long, with many different colors and in 4, 6, and 9-inch square blocks. These blocks are not individual, but are vulcanized into one solid sheet, thus eliminating one of the hazards of cut tile floors, namely, too many seams.

Distributers have been appointed in the principal cities of the United States, who report a favorable reception of the new flooring. A. J. Huston is Aetna's vice president and sales manager.

The B. F. Goodrich Co., Akron, O., has purchased a new Lockheed-Vega four-passenger plane for use in transporting its officers and sales representatives between various branches. This ship will succeed the Fairchild four-passenger plane which the company has used for about one year. Lee Shoenhair, who recently succeeded "Cy" Caldwell as pilot for Goodrich, will pilot the new ship.

Paul W. Litchfield, president of the Goodyear Tire & Rubber Co., Akron, O., recently was elected a director of the United States Chamber of Commerce. He will represent the fifth election district, composed of Ohio, Indiana, Michigan, and Kentucky.

The Triangle Tire & Rubber Co., Canton, O., besides continuing to make tires and inner tubes, will produce also garden hose, desk pads, stair treads, and a general line of mechanical goods. Evan Brewster is executive vice-president.

The American Hard Rubber Co., Akron, O., has announced the promotion of W. E. Johnson to superintendent and D. V. Cowan as production supervisor. Both men, who have been with the company approximately eleven years, stepped up from positions as assistants to their new titles, after having served as active heads. They were honored at a meeting of sixty foremen and assistants at a dinner held on May 14. A. Light, who has been with the company fifty-seven years, acted as toastmaster.

Cincinnati Rubber Mfg. Co., Norwood, O., has awarded a contract to Austin Co. for an addition to manufacture rubber rolls for paper-making machines. A ten-ton bridge crane will be installed.

New Campaign for Goodrich Sport Shoes

The B. F. Goodrich Rubber Co., Akron, O., has inaugurated a new advertising campaign for its sport shoes, that will continue throughout the season. An outstanding feature is the use of the testimony of Chief Buffalo Child Long Lance, great Indian athlete and warrior, hero of the gridiron and battlefield. Long Lance is pictured in full native regalia on a horse before his tepee. His autographed letter is printed and a brief account of his exploits is given. The remainder of the copy is devoted to an illustrated description of the sport shoes. This advertisement will be conspicuously placed in the outstanding magazines for boys to attract the attention of the young readers who, naturally, will show it to their parents and want sport shoes just like those of Long Lance.

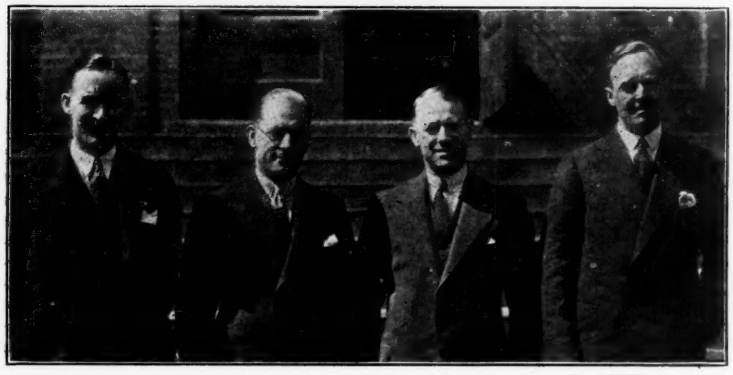
W. O'Neil, president of the General Tire & Rubber Co., Akron, O., announced that his company is about to complete negotiations for the purchase of a fleet of cabin monoplanes to be used in a nation-wide tour of the United States, Mexico, Cuba, and Canada. With this fleet it is planned to demonstrate the practicability and superiority of heavier-than-air machines for commercial transportation purposes, not only in single units but also as a fleet operation.

The Goodyear-Zeppelin Corp.'s president, Paul W. Litchfield, Akron, O., recently discussed in conference with President Herbert Hoover the plans for the construction of a huge super-dirigible for use in the trans-Pacific mail service. The ship would carry a crew of about fifty, would have accommodations for about one hundred passengers and a cargo of ten tons of mail. The speed would be about ninety miles per hour.

Harvey S. Firestone, president of the Firestone Tire & Rubber Co., Akron, O., was named referee for the International 500-mile automobile race at the Indianapolis Motor Speedway held on May 30.

Edward S. Babcox, publisher of the *India Tire and Rubber Review,* recently donated to Akron University, Akron, O., two annual scholarships to encourage interest in trade-publication work. The scholarships, based on character, scholastic standing, and experience, are to be awarded each spring to two members of the junior class. During his senior year, each of the winners will receive $150 in cash.

The C. P. Hall Co. has announced the removal of its offices to 504-505 Akron Savings & Loan Building, Akron, O. The telephone number remains unchanged, Main 3340.



Returning to Akron after a ten-year absence, S. Oxon and A. S. Bishop, managers of the Manchester branch and of the commercial tire department, respectively, of the Goodyear Tire & Rubber Co., Ltd., Wolverhampton, England, expressed amazement at the growth of the home plant. Both men, natives of England, were in Akron about a decade ago for a factory course. They will spend several weeks in the United States studying conditions.

Left to right: J. M. Linforth, Goodyear Export Co., Akron, O.; S. Oxon; A. E. Patterson, Goodyear Export Co.; and A. S. Bishop.

Toledo Rubber Products Corp., 630 Highland Ave., Toledo, O., has been chartered with a capital of $50,000 by E. W. Coble, F. M. Williams, formerly of the Williams & Thorner Candy Co., William F. Miller, and Virgil Dunlap. It is expected that the new plant, when fully equipped, will employ 125 workers to start. Rubber rugs will be, for a time at least, the company's principal product.

The Goodyear Tire & Rubber Co., Akron, O., through its president, Paul W. Litchfield, has confirmed the purchase of the old Kelly-Springfield Tire Co. plant at Akron. This plant was bought because of its convenient position between the Goodyear plants Nos. 1 and 2. No statement has been issued regarding the use that will be made of the acquisition.

The Columbia Tire & Rubber Co., Mansfield, O., was duly adjudicated bankrupt on May 1. The first meeting of creditors was held on May 27 at the Court of Appeals Room, Court House, Mansfield, before William C. Beer, referee in bankruptcy.

A. H. Noah, formerly general manager of the Diamond Rubber Co., Akron, O., is recovering from an illness at City Hospital, Akron, where he was taken on May 11. Since his condition had become worse following his return from Florida where he spent the winter, it was necessary to send him to the hospital.

Victor A. Parker, long and well known in the rubber industry, has joined The R. H. Frietag Manufacturing Co., Akron, O., in the capacity of sales representative.

G. L. Seeley, for several years a member of the Export Co., Firestone Tire & Rubber Co., Akron, O., recently left Akron for South America in the interests of the company.

The Miller Rubber Co., Akron, O., has announced the appointment of J. K. Brenton as advertising manager. He was formerly assistant advertising manager, and he now fills the position held by H. R. Baker, who recently resigned from the company.

National Rubber Machinery Co.

The National Rubber Machinery Co., Akron, O., reports sales for the first quarter of the current year aggregating $1,034,147, compared with $757,702 in the corresponding quarter of 1927, an increase of 36.2 per cent.

Mohawk Flat Tread Casings

The Mohawk Rubber Co., Akron, O., now makes 29 by 5.00 in the 6-ply Flat Tread Special type. This is the original equipment for the following 1929 cars: Chandler, DeSoto, Durant, Elcar, Graham-Paige, Pontiac, and Whippet. Mohawk is also making 30 by 6.50 in the 6-ply Flat Tread Special Balloon casing. This is the original equipment for 1929 on Auburn, Reo, and Locomobile.

New President of Adamson Machine Co.

When Alexander Adamson, founder, president, and general manager of The Adamson Machine Co., Akron, O., died on March 3, a place was left vacant in his organization that only a most capable man could fill. In view of this, it is significant to note that Russell B. Koontz, long associated with Mr. Adamson, was elected president and general manager at a special meeting of the board of directors of the company.

Russell B. Koontz

Mr. Koontz began working for Alexander Adamson in 1902. His rise in the company reads like the story of a Horatio Alger hero—a man who made good because he had the "stuff" in him to make good. Russell Koontz has held the positions of superintendent, manager, secretary-treasurer, and assistant general manager. In fact, when Mr. Adamson incorporated his company in 1909, Mr. Koontz became secretary-treasurer and held that office until his promotion in March, 1929.

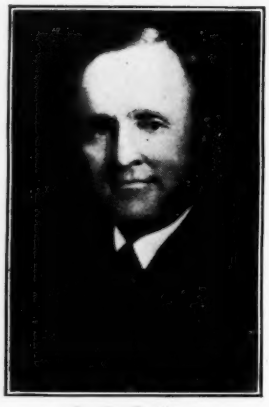
Prior to his connection with the Adamson organization, he was with The B. F. Goodrich Co. from 1893 to 1895, and again as manager of the St. Louis branch from 1898 to 1899. During 1895 to 1898 Mr. Koontz worked for the Palmer Pneumatic Tire Co., Chicago, Ill. The three years before he joined with Mr. Adamson were spent in the service of E. & H. Densmore Co., Brooklyn, N. Y.

Mr. Koontz was born in Greensburg, Summit Co., O. He attended the country schools, a preparatory school, Buchtel College, and Ohio Northern University. He was graduated with the degree of Civil Engineer in 1893.

Many prominent organizations claim him as a member, including the Masonic Lodge, the United States and Ohio chambers of commerce, the Akron City and Masonic Club, and the Y. M. C. A.

Mr. Koontz resides at 154 Massillon Rd., Akron, O.

Repair Material Sales Manager



J. G. Scales

In March, J. G. Scales was placed in charge of repair material sales for The Goodyear Tire & Rubber Co., Inc., Akron, O. Mr. Scales has had considerable experience in selling repair and vulcanizing equipment and assisting dealers in the best methods of vulcanizing work. He began his service for Goodyear in 1912 when he was chief chemist for the Canadian Goodyear organization. A year and a half later, he was made assistant to the superintendent of the Akron mechanical goods plant. He served in the development department before he was assigned to sundries sales in 1926. During the World War he was in charge of repair materials and methods in the army schools.

Goodrich Expansions

With the completion of the new Goodrich tire plant at Atlanta, Ga., building operations to begin early this summer to be completed in time for tire manufacturing the first of next year, The B. F. Goodrich Rubber Co., Akron, O., will have eight manufacturing units in its world-wide organization. The parent plant with 120 acres of floor space is at Akron. A new tire warehouse, just completed, added 316,000 feet of floor space to the parent plant. Other plants are located at Colombes, France; Leyland, England; Yokohama, Japan; Kitchener, Ont., Canada, and Los Angeles, Calif. The first of this year a tire-cord mill at Thomaston, Ga., was acquired, its capacity to be more than doubled.

Goodrich expansion operations, planned and under construction, aggregate a total of more than $10,000,000 of which about $7,500,000 is being expended in building the Atlanta plant and increasing tire-cord facilities at the Martha Mills at Thomaston. The Thomaston cotton mills, however, will not supply all the cotton products required in manufacturing many of the 32,000 products made by this huge industry. Other mills in various parts of this country produce millions of yards of fabric and cord for thousands of products of combined rubber and cotton.

EASTERN AND SOUTHERN

The General Atlas Chemical Co., controlled by Henry L. Doherty & Co., 60 Wall St., New York, N. Y., has taken over the sale of Gastex gas black as of May 1. The Grasselli Chemical Co., Cleveland, O., formerly handled this gas black although it was developed and manufactured by Henry L. Doherty & Co.

This change in sales arrangement is due to the absorption of the Grasselli company by the duPont interests whose policy is to sell only products of their own manufacture. C. T. Wright, vice president of the General Atlas Chemical Co., is in charge of operation. F .C. Batchellor, formerly with Ault & Wiborg, is sales manager, and Dr. D. J. Beaver is director of the laboratory for technical service.

F. B. Davis, Jr., president of the United States Rubber Co., New York, N. Y., has announced the intention of the company to continue planting operations on a moderate scale on its great rubber plantations in the Far East during the current year. The company's holdings are in Sumatra and Malaya. The number of trees now totals more than 12,000,000 covering more than 140 square miles. The company, through developing strains of super-yielding trees, and through economies, expects to reduce its cost of production each year. The plantation yield is large enough to supply only a part of the company's crude rubber needs, and the remainder is bought in the open market.

Nagle Machine Co., manufacturer of rubber working machinery, Erie, Pa., has announced that Garrett C. Burgess is now acting as exclusive agent for Nagle products in Michigan. Mr. Burgess has had considerable experience in rubber working machinery and for about twenty years was employed by the United States Rubber Co.

Keystone Tire & Rubber Co., New York, N. Y., adjudged bankrupt on February 14, has liabilities amounting to $497,643, while its assets amount to $12,831, including the main item accounts payable, $12,713.

Dr. Ellwood B. Spear, for over six years chief chemist of the Thermatomic Carbon Co., Pittsburgh, Pa., has resigned. Dr. Spear is enjoying a vacation at his summer home in Wilton, N. H.

Robert Stewart has been appointed superintendent of the Goodyear Clearwater Cotton Mills No. 2 now under construction at Rockmart, Ga., according to an announcement by the Goodyear Tire & Rubber Co., Akron, O. He had been assistant manager of the Goodyear Devon Mills at New Bedford, Mass. Mr. Stewart was born at Woonsocket, R. I. He is a graduate of Tufts College. For six years he was overseer of carding for S. Slater & Sons, Webster, Mass. He resigned that position to become assistant superintendent at Devon Mills.

The United States Rubber Co., New York, N. Y., has announced the appointment of G. M. Tisdale as director of purchases. He had been assistant general purchasing agent for the company since 1921. Prior to this connection, Mr. Tisdale, who is an Annapolis man, was with the United States Navy until 1920 when he attained the rank of lieutenant commander.

The company has announced also the appointment of L. M. Simpson as general sales manager of its tire department. Starting with the United States Rubber Co., at Los Angeles more than 10 years ago, Mr. Simpson has had a steady advancement in the organization, due to his clear-cut grasp of tire merchandising. He also served as branch manager at Sacramento, Calif., Salt Lake City, Utah, and Portland, Ore. Then he went to Detroit as central manager, tire sales, with Detroit, Cincinnati, Cleveland, Pittsburgh, and Toledo, and surrounding territory as his field of operations. Recently he has been stationed at the general offices of the company in New York.

Middleton & Co., Ltd., has announced the removal of its offices to 44 Whitehall St., New York, N. Y., and the change of its telephone number to Whitehall 5671.

Neil Currie, Jr., for the past five years managing engineer of the motor department of the Pittsfield Works of the General Electric Co., Schenectady, N. Y., has been named manager of the Philadelphia Works of the company. Robert V. Good, section superintendent in the Schenectady Works since January 1, 1928, has been named assistant to the manager at Philadelphia.

C. S. Ching, director of industrial and public relations, United States Rubber Co., New York, N. Y., was reelected president of the American Management Association at its meeting held in New York early in May. All other officials also were reelected.

Brighton Mills Now in Georgia

Brighton Mills, located in Passaic, N. J., since 1900, are completing a move begun three years ago when they established a cord-tire-fabric unit at Shannon, Ga., to be followed early this year by a concentration of all their manufacturing at that point and the abandonment of their plants both at Passaic and Allwood, N. J. The general offices are being moved, effective June 1, from Passaic to the Candler Building, Atlanta, Ga.

Brighton Mills are pioneer manufacturers of tire fabrics, having made the first piece of cotton tire fabric which was used in the manufacture of a bicycle pneumatic tire in 1892. They have continued to serve and grow with the tire business from the bicycle to the automobile tire, and have kept pace with the developments from the old square-woven type of fabric to cord-woven fabric as well as cord on cones.

Their facilities in the South have been increased and their products cover a full range of tire fabrics, including cord, chafers, and breakers. In addition to the machinery moved from New Jersey to Georgia, some departments have been entirely revamped and new machinery installed, bringing the plant up to date in equipment, methods, and efficiency.

The officers of the company are: William L. Lyall, chairman of the board of directors; Julian K. Morrison, president and treasurer; Thomas M. Gardner, secretary; LeRoy H. Daniell, assistant treasurer; E. H. Bolen, assistant treasurer and assistant secretary; and Timothy J. Kelly, vice-president and factory manager.

The Manhattan Rubber Manufacturing Co. Merger

Announcement is made of the merger of The Manhattan Rubber Mfg. Co., maker of mechanical rubber goods and Hycoe automotive products, Passaic, N. J., the Raybestos Co., Bridgeport, Conn., and the United States Asbestos Co., Manheim, Pa. The merger was consummated through the banking firms of Hayden, Stone & Co., Hemphill Noyes Co., and the Equitable Trust Co. of New York. A. F. Townsend, president of The Manhattan Rubber Mfg. Co., has issued the following statement:

"A company will be formed which will take over the stock of these three companies, and this company will be organized along the lines of the U. S. Steel and General Motors companies. The operations of each of the individual companies will be conducted by their present officers, and there will be no changes in the personnel or management of these individual units.

"The Manhattan Rubber Mfg. Co. has for a long time been large manufacturers of mechanical rubber goods, brake lining, clutch facings, and other accessories for the automobile industry. The Raybestos Co. and the United States Asbestos Co. are also outstanding manufacturers in similar lines, with the exception of mechanical rubber goods. The combined output of these three companies, as far as brake lining and clutch facings are concerned, will be the largest individual unit in the business, and it is felt that the economy due to a consolidation of this sort in the manufacturing and selling departments, will enable the company to not only maintain but enhance and increase its position in the trade."

NEW INCORPORATIONS

HORTON & FIELD, Feb. 21 (New Jersey), $125,000. A. E. and M. L. Horton, 812 Kelsyth Road, Elizabeth, N. J., and C. H. Field, 529 East 22nd St., Brooklyn, N. Y. Principal office, 109 Broad St., Elizabeth, N. J. To manufacture rubber boots and shoes and other rubber goods.

PARAMOUNT RUBBER FLOORING CORP., Apr. 5 (New York), $20,000. H. and G. Weidenbaum, 165 West 197th St., and M. Robson, 2 Lafayette St., all of New York, N. Y. Principal office, Bronx, N. Y. Rubber tile flooring.

SYNTHETIC RUBBER CO., Feb. 28 (Delaware), capital stock 200,000 shares without nominal or par value. A. V. Lane, C. S. Peabbles, and L. E. Gray, all of Wilmington, Del. To deal in synthetic rubber and other rubber products.

TRI-STATE RUBBER CO., Mar. 27 (New Jersey), $125,000. A. N. and E. Shutt, 184 Lincoln Ave., and E. Savage, 472 Laurel St., all of Orange, N. J. Principal office, 4 Sheridan Ave., Orange, N. J. To manufacture all kinds of rubber goods.

FINANCIAL

Boston Woven Hose & Rubber Co.

Boston Woven Hose & Rubber Co., Boston, Mass., recently issued a letter to the stockholders containing the results of its operations for the first six months of its current fiscal year. The net sales for the period were $4,401,460.71, an increase, despite lower selling prices, of $177,818.15 over last year. The net profit was $513,370.61 after all charges, including depreciation and reserve for federal taxes, but before preferred and common dividends, and equal, after deduction of preferred dividends, to $5.70 per share earned on the common stock for the six-month period. The company reports also that its gain in net sales has continued to improve since March 1.

Goodyear Tire & Rubber Co.

The Goodyear Tire & Rubber Co., Akron, O., will pay a dividend of $1.25 to all common-share holders on August 1. This is the first dividend since 1920 and is indicative of extremely favorable earnings for 1929. Various reports state that the earnings this year would be approximately $14 per share.

Fisk Rubber Co. Increases Stock

Stockholders of Fisk Rubber Co., Chicopee Falls, Mass., have authorized an increase in common stock from 1,250,000 to 2,000,000 shares. Present stockholders will be given the right to subscribe to an additional 851,306 shares at $11 a share on the basis of one new share for each share held.

The Biggs Boiler Works Co., Akron, O., has announced the removal of its eastern sales office from 300 Madison Ave., New York, N. Y., to 250 Church St., also in New York.

Activities of
The Rubber Manufacturers Association, Inc.

Adoption of New Name

At a special meeting of The Rubber Association of America, Inc., held on May 10 at the Hotel Plaza, New York, N. Y., the name of the Association was changed to The Rubber Manufacturers Association, Inc., and membership was limited to firms, corporations, and individuals directly engaged in the manufacture of rubber products in the United States. The proposed changes in the constitution and by-laws were adopted.

Frank A. Seiberling, president of The Rubber Association of America, Inc., and also of the Seiberling Rubber Co., Akron, O., will continue as president of the new group. At the meeting he expressed his sincere intentions of continued cooperation. He, furthermore, firmly believes that the new organization will further the development of the rubber industry.

The Rubber Institute, Inc.

At a special meeting of The Rubber Institute, Inc., also held on May 10, it was voted to dissolve the Institute, and to turn over to The Rubber Manufacturers Association, Inc., the unfinished business of the Institute as at the time of dissolution. The action of both organizations was taken as the final step in merging the interests of the two; and the dissolution of the Institute as a separate corporation was considered the most feasible method of transferring the activities of that organization to the new Association. That Association will continue the cooperative work developed by the Rubber Association over a period of years in all branches of the industry.

The Institute had been formally organized in New York, N. Y., on June 1, 1928. Representatives of forty-two rubber manufacturing companies had attended and approved the organization declaration. General Lincoln C. Andrews had been chosen director.

New Members

At a meeting of the board of directors of The Rubber Manufacturers Association, Inc., also held on May 10 at the Hotel Plaza, F. B. Davis, Jr., president of the United States Rubber Co., New York, N. Y., was elected a director to succeed C. B. Seger, resigned. At the same meeting, the Manhattan Rubber Manufacturing Co., Passaic, N. J., was elected to membership in The Rubber Manufacturers Association.

Revision of List of Manufacturers and Rubber Products

The Rubber Association is revising and bringing up-to-date its list of American rubber manufacturers and manufactured rubber products in the United States. Consequently it has circulated to all manufacturers of whom it has a record, forms listing the principal rubber products and has asked the manufacturers to check and return these forms to the Association office. The Association will be pleased to send copies of this form to any manufacturers who may not have received them if they will request copies from the Association office at 250 West 57th St., New York, N. Y.

Traffic Committee

A regular meeting of the Traffic Committee of The Rubber Manufacturers Association, held at the Akron City Club, Akron, O., on May 22, was well attended, twenty members representing as many different companies being present. Only routine business was discussed.

Heel and Sole Division

At a meeting of the Heel and Sole Division of The Rubber Manufacturers Association, held at the Copley Plaza Hotel in Boston on May 14, K. W. Wolcott of The B. F. Goodrich Co., Akron, O., was elected chairman of the division for the ensuing year. D. A. Cutler of the Alfred Hale Rubber Co., Atlantic, Mass., was elected vice chairman.

Goodyear Operations

The Goodyear Tire & Rubber Co., Akron, O., according to its president, Paul W. Litchfield, has purchased its third tire-fabric plant in the South. The company has recently obtained title to the plant of the American Textile Co., at Atco, near Cartersville, Ga. The Atco mills will be converted from a cotton textile plant into a tire fabric mill and will operate 50,000 spindles, which will make its capacity equal to those of the two other fabric mills operated by Goodyear at Cedartown and Rockmart, Ga.

The Atco plant has been employing about 650 workers. But this will be increased to 1,000 by the Goodyear company. Housing conditions near the mill as well as the mill equipment will be materially improved immediately. The expansion program will amount to about $1,000,000.

Construction has just been started on the plant at Rockmart. The contract for the erection of 350 houses at Rockmart has also been awarded. Rapid progress is being made on the new tire plant at Gadsden, Ala. This plant is to be in operation by early fall.

Goodyear's extensive operations in the South are in accordance with its general expansion program. Location of the textile plants in the South is a stategic move because the raw product is grown in that section.

Work on the Goodyear-Zeppelin Corp.'s airship factory and dock is going forward with dispatch. This is to be the largest building without interior supports in the world. The structure is to be completed by the latter part of the summer. Construction of two airships will be started for the Navy as soon as the factory has been completed.

NEW JERSEY

There has been a decided increase in all lines of the rubber industry during the past month and some of the concerns have been compelled to operate overtime to catch up with orders. Hose and belting have shown a 100 per cent improvement, and orders for these products have nearly doubled. Factories manufacturing rubber tiling are operating 24 hours a day. Hard rubber business has shown much improvement during the month. The tire situation remains good. The summer season has caused a demand for rubber shoes. There has been no change in the heel and sole production.

C. Edward Murray, Jr., president of the Murray Rubber Co., Trenton, N. J., spent some time visiting in Kentucky and Tennessee, where his concern is establishing chain stores.

William Minser, formerly with the Thermoid Rubber Co., Trenton, N. J., has been made sales manager for the Colyear branches in Seattle, Tacoma, and Yakima.

The Combination Rubber Co., Trenton, N. J., announces that several new agencies have been established throughout the middle west and northwest. Nichols, Dean & Gregg, St. Paul, Minn., will look after the territory in that section, while Warshawsky & Co., Chicago, is covering the Illinois territory. The Combination Co. is now operating to capacity.

The Puritan Rubber Co., Trenton, N. J., announces an increase of 100 per cent in business over last month. The company is now operating 24 hours a day. New equipment was recently added and the company is now able to fill orders for rubber tiling.

Mercer Rubber Co., Hamilton Square, N. J., reports that business shows some improvement over last month.

The Thermoid Company, Trenton, N. J., announces that the plant is running to capacity and that conditions are good for the coming season.

F. Robert Lee, general sales manager of the Thermoid Company, has been on an extended business trip along the Pacific Coast. He visited the company's offices in the West and was absent for three weeks.

The Luzerne Rubber Co., Trenton, N. J., reports that conditions in the hard-rubber line show some improvement over last month.

The Rubber Manufacturers' Association of New Jersey, will soon hold its summer meeting at Trenton, N. J. Following this, no meetings will be held until next fall. The organization formerly held meetings monthly, but now meets once every two months.

The Joseph Stokes Rubber Co., Trenton, N. J., reports that business is very good with many new orders on hand. A large three-story addition is being completed at the company's plant at Welland, Ont., Canada. The Canadian plant became rushed with orders and it was necessary to build an addition.

Whitehead Brothers Rubber Co., Trenton, N. J., reports that business has increased considerably during the past month. The company is now operating with night shifts on fire and garden hose and in the mill rooms.

The Murray Rubber Co., Trenton, N. J., is very busy both in the manufacture of tires and tubes and also in the mechanical goods departments. The concern is working on large contracts recently received from the United States Steel Corp. and other corporations. The company is preparing to open warehouses for tires in Atlanta, Ga., Nashville, Tenn., Memphis, Tenn., Charlotte, N. C., and Jacksonville, Fla.

The company has opened many stores throughout the southern states during the past few weeks. The Murray chain-store plan places high quality tires and tubes in the service of the customer at low prices, yet with profit to the dealers. The new system also gives automobile owners free personal service which the mail-order houses can not furnish.

Charles E. Stokes, president of the Home Rubber Co., Trenton, N. J., and Mrs. Stokes have been spending some time in the Pocono Mountains.

J. Edward Myers, superintendent of the Acme Rubber Manufacturing Co., Trenton, N. J., has been elected president of the Trenton Rotary Club.

Theodore S. Cart, president of the Atlantic Products Corp., Trenton, N. J., spent two weeks in Chicago with his family.

Horace B. Tobin, president of the Woven Steel Hose & Rubber Co., Trenton, N. J., is a member of the Grand Jury at Trenton.

NEW ENGLAND

The Clifton Manufacturing Co., Jamaica Plain, Boston, Mass., manufacturer of rubberized clothing, tapes, etc., has reorganized its production department. Mr. Wakefield, formerly in charge, has been placed at the head of the cost department. Miss Levine, office manager, is to handle production in her department.

Fisk Truck and Bus Tire Department Head

N. B. Brodhead has been appointed as manager of the Truck and Bus Tire Department of the Fisk Tire Co., Inc., Chicopee Falls, Mass., and has already assumed his duties in that capacity.

Mr. Brodhead comes to Fisk with ten years of experience in the tire business

N. B. Brodhead

and a wide acquaintance in the rubber business. Previous to this appointment, Mr. Brodhead was connected with the Kenyon Tire Co. as assistant to the president. His home is in Bryn Mawr, Pa.

Harvey S. Firestone, president of the Firestone Tire & Rubber Co., Akron, O., was the speaker at the Boston Chamber of Commerce luncheon held on May 21. His address was in connection with the centenary of the rubber industry in the United States, which started in Roxbury in 1829.

In his address Mr. Firestone paid high compliment to Thomas A. Edison, Henry Ford, Calvin Coolidge, and Herbert Hoover, all of whom he counted among his personal friends. He expressed the belief that Mr. Edison will soon succeed in developing a plant and a process for making rubber in this country, and declared that the great inventor had already achieved partial success.

The American Rubber Co. held a rally early in May which was attended by more than eight hundred workmen in the yard of the Binney St. plant, Cambridge, Mass., to inaugurate No Accident Month. Safety talks were given by George S. Woodward, factory manager, and Patrick F. Shea, safety officer of the Police Department. Prizes will be awarded to those employes who offer the best slogans and rules for safety. The judges are Professor Carroll W. Doten, of M. I. T., John P. Meade, director of the division of safety at the State House, and Deputy Chief Cutler L. Vose of the local fire department.

Goodyear Rubber Co., Middletown, Conn., announces that final stockholders' meetings will be held in the near future to consider and confirm the vote and action of the board of directors voluntarily dissolving and its corporating existence terminated in accordance with law; also to take further action as to liquidation of its assets, the payment of its indebtedness, and the winding up of its affairs as the stockholders may deem advisable.

A new company with the same name, organized under the laws of the State of Connecticut on January 30, 1929, is now operating the Middletown plant and producing the same Gold Seal rubber footwear for which the old company was noted.

The Converse Rubber Shoe Co., Malden, Mass., maker of Converse athletic shoes, rubbers, etc., has chosen Huber Hoge, Inc., New York advertising agency, to handle its account. Advertising in farm and business periodicals and newspapers will be used extensively.

MIDWEST

The Gates Rubber Co., Denver Colo., recently held a five-day convention at the factory in Denver. Forty district managers and field men attended. Edwin J. Tesdell, manager of the accessory division, spoke of the strength of the company in the United States and seventy-five foreign markets and stressed vividly the bright future ahead for Vulco products. J. H. Carey, tire division sales manager, spoke about the Gates Vulco tire. A banquet and smoker at the mountain chateau of President Charles C. Gates and a futuristic banquet at the factory were outstanding features in the entertainment.

Seven jobbing organizations in widely separated sections of the United States have been added to the list of Vulco tires and tubes distributers. Recently, a new tire unit was completed in the Gates plant, which by doubling the tire capacity is expected to relieve the oversold condition. The factory is operating three eight-hour shifts a day.

Crown Rubber Co., Omaha, Neb., manufactures tires and auto accessories. The officers are C. A. Hammond-Knowlton, president; Dwight Williams, vice president and general manager; J. H. Davies, treasurer; Storrs Hammond-Knowlton, secretary; Wade E. Sheppard, factory manager; Glenn B. Williams, purchasing agent; and Alfred Iknayan, chemist.

St. Clair Rubber Co., Marysville, Mich., through C. A. Pfeffer, general manager, has announced an extensive new program to broaden merchandising activities. In connection with these plans, William A. Watts has been appointed director of sales, to operate directly from the Marysville factory. Mr. Watts had been connected formerly with the Pantasote & Standard Textile Products Co.

Activities of the National Tire Dealers' Association, Inc.

The National Tire Dealers' Association will hold a convention on November 11-14 at the Hotel Sherman, Chicago, Ill. Concurrent with the convention the National Tire Dealers' Association Show will be conducted. The latter will include an exposition of tire, gasoline, garage, and super-service station equipment.

PACIFIC COAST

Goodyear Tire & Rubber Co. (Calif.) officials on May 19 accepted delivery at the United States government aeronautic station, Ross Field, Arcadia, Calif., of the new dirigible balloon, the "Volunteer," which had been sent in sections from the Goodyear-Zeppelin plant in Akron. The dirigible named like its sister airships by President P. W. Litchfield after American cup defenders, will, when assembled, be 174 feet long by 36 in diameter, will have two motors, and hold four passengers. Karl Lange, former Navy dirigible pilot, who at once took charge of the balloon, expected to get it into the air and deliver it at the new "dock," as the permanent landing place will be called, alongside the big Goodyear tire works at Central and Florence Aves., Los Angeles, on June 1. The dirigible will be used for some time to come for training and demonstration, or while the Goodyear-Zeppelin interests are working out plans for transcontinental and interoceanic transportation.

Production at the Goodyear factory, despite a large and steady increase in the working force and three shifts a day, continues to mount fast, having risen in May to over 15,000 tires on an average a day, compared with a daily average in April of 13,000. It is said that there are no signs of a let-up for some months to come. Burgess Darrow, in charge of development at the parent Goodyear plant in Akron, was a mid-May visitor at the Los Angeles plant. President John W. Mapel announced that the elaborate plan for the overhauling and increasing of the mechanical equipment whereby utmost use can be made of space available for production so that largely-augmented output can be achieved without further extension of mills in the near future, has been practically completed.

United Rubber Corp., San Francisco, Calif., according to President Herbert King, has for 2½ months been running 24 hours a day on hard rubber products, largely battery boxes, and which are widely distributed throughout the Pacific Coast territory. The prospects are said to be good for business keeping up at the same rate throughout the summer and fall. Some minor additions to equipment have been made at the factory, 37 Arkansas St., recently, and several specialties in mechanical rubber goods have been added to the list of products. A few molded items in the sponge rubber line will probably be added to the list later.

Durable Mat Co., 2926 16th Ave., S. W. Seattle, Wash., and which maintains branches at 146 Superior St., Victoria, B. C., and 99 Chambers St., New York, N. Y., is rapidly increasing its sales of non-skid mats, according to Morris Plummer of the distributing department. For the time being the company has decided not to establish a branch factory in the Southwest, which it had contemplated, but it is planning through Manager H. W. Bell to open one in the Midwest within a couple of months, Mr. Bell having lately spent much time in that section considering suitable locations. Asserting that the unique mats not only safeguard workers but increase efficiency, many large manufacturers are installing them in midwest plants, the latest being the Bendix Brake Co., South Bend, Ind.

The newest product of the Durable Mat Co. is an all-rubber built-up ship fender, designed to replace the old-time hanging logs or plaited-rope devices used for protecting ships' sides at docks or alongside other vessels. It is stated that the novelty is being well received in maritime circles. The company's officers are: president, C. L. Morris; vice president and general manager, H. W. Bell; secretary and treasurer, C. T. Lyons.

H. Muehlstein of Muehlstein & Co., Inc., crude and scrap rubber dealer, New York, N. Y.; Sydney Smith, son of C. Harold Smith of the Binney & Smith Co., New York, N. Y.; and Charles Young, rubber broker, Colombo, Ceylon, have been recent guests of Pacific Coast rubber manufacturers.

John Stauffer, Sr., of San Francisco, vice president of the allied Stauffer Chemical Companies of the United States, and his son, John, Jr., manager of the southwest divisions, sailed for Europe on May 20 and will be guests at Chateau de Senejac, Blanquefort, Gironde, France, of M. C. de Guigne, president of the American and European chemical companies operated by the Stauffer interests.

Pacific Goodrich Rubber Co., Los Angeles, Calif., reports for the first quarter of 1929 the production of 318,397 tires and 268,647 tubes. Production is being rapidly stepped up, until it now averages 5,250 tires and 4,500 tubes daily, according to Secretary J. C. Herbert. When the installation of recently-received machinery is completed, it is stated that the output will be at once increased to 5,500 tires and 5,000 tubes a day. It is stated that not only is there a steady and considerable growth of business in the eleven far-west states served by the Pacific Coast factory, but of late there has been a notable growth in overseas trade. The new equipment will also enable the factory to produce airplane tires, for which a considerable business it said to be assured, and also Silvertown De Luxe super-tires, hitherto produced only by the parent Goodrich concern of Akron.

The Los Angeles Goodrich factory already has nearly 1,100 employes, working three shifts a day, and the introduction of the new machinery will require a considerable addition to the force. Basing calculations on the 11 per cent increase in automobile registrations within the past year in the territory it covers, and on other factors, the company expects its 1929 business to show a substantial increase. Plant Superintendent Fred A. Nied has been spending the past fortnight in Akron

conferring with officials at the main works.

Samson Tire & Rubber Corp., Los Angeles, Calif., has been making substantial progress in the erection of the huge buildings that will form the new factory group and make one of the industrial showplaces of the Southwest. Construction thus far has been even ahead of schedule, and President A. Schleicher is assured by the builders that the big tire works will be ready for operation by the end of the year. The steel frame and the roof of the administration building have been put in place, and the various mill lines are expected to be up by July 1. Several heavy mechanical units were placed on foundations before walls were started.

Generally throughout the country Samson sales have for many months past been remarkably good, it is stated, and orders now are far ahead of production, although the company is pressing its main plant at Compton and its subsidiary factory at San Diego to the utmost, both working 24 hours every day. A sales quota increase of 60 per cent had been set for the first quarter of 1929, yet orders went 20 per cent over the quota, making the quarter by far the best in the company's history. The company has been notably fortunate with its working force, the labor turnover being almost negligible. The fact that a great many employes own homes near the plants is regarded as a favorable factor, and the maintenance of pleasant industrial relations has also played an important part.

Globe Tire & Vulcanizing Co., 237 W. Jefferson St., Los Angeles, Calif., is becoming one of the largest users of tire-repair materials in the Southwest. According to the three Reade brothers who operate the concern, business has increased 700 per cent within six months. From a daily output of 20, production has grown to 140 rebuilt tires a day, and compelled the extension of the works and the installing of many more tire molds.

Golden State Rubber Mills, Inc., 1920 E. Vernon Ave., Los Angeles, Calif., continues to be one of the very busy of the smaller rubber manufacturing concerns in the Southwest. President Emmet S. Long states that a considerable business is being done in making and marketing 6-H protector sleeves for saving strings of tools and casings in drilling oil wells, sponge rubber and general mechanical specialties, and in the molding of Celeron, a phenolic-resin material for valve seats, rings, insulators, etc.

A large business has developed in Los Angeles in the making and selling of rubber bands cut from old inner tubes, and which are being increasingly used in newspaper offices, markets, department stores, etc. Two of the leaders in this line, which have developed special equipment for the purpose, are Wm. G. Calder, 2056 Venice Blvd., and the Eclipse Wrapping Band Co., managed by C. R. Nichols, 2021 E. 77th St., Los Angeles, Calif.

Northwest Paper Makers Plan Large Extensions

Rubber companies on the Pacific Coast which specialize in covering rolls for paper manufacturers are much interested in the reports of greatly-increased activity among the paper makers in the Northwest. Some very large new mills and considerable additions to old mills are being constructed at Camas, Shelton, Hoquiam, Port Angeles, Townsend, Bellingham, and Everett, Wash. Besides press rolls, the mills also use rubber couch and worm rolls, rubber-lined pipe and fittings, special washup, fire, water, mill, and steam hose, and transmission and conveyer rubber belting.

California Firestone Will Double Present Output

Firestone Tire & Rubber Co., of California is doubling its already big plant at Los Angeles. On May 15 ground was broken for a reenforced concrete structure which will be a duplicate of the present main factory building, and, which forming an extension of the latter, will enable the company to increase its output over 100 per cent. It is stated by C. A. Myers, vice president of the parent Firestone company at Akron, and who is in charge of engineering and plant construction in Los Angeles, that plans require the completion of the big extension by January 1, 1930; and that the equipment will include not only all the well-correlated and synchronized machinery units and conveyer systems used in the first-built factory section, but also a number of important additions that will make the continuous straight-line manufacturing methods even more efficient.

The present capacity of the Firestone plant is somewhat over 5,000 tires and 7,500 tubes a day, but the enlarged factory will raise the capacity to 12,000 tires and 14,000 tubes; and it will also mean an investment of several million dollars more for buildings and machinery, raising the yearly payroll to some $5,000,000, the consumption of about 3,500,000 pounds of crude rubber from Singapore and 1,000,000 pounds of cord fabric from the Firestone mills at Fall River and New Bedford, Mass. The first tire was made at the Los Angeles plant by President Harvey S. Firestone, Sr., June 17, 1928, and since then demand has increased so fast that even with the entire works speeded to the limit and working night and day it is impossible to keep up with orders.

L. W. Hayden Rubber Co., conducted by Mr. Hayden, 1220 W. Pico St., Los Angeles, Calif., which has been producing much camelback and other tire-repair material, contemplates going into the molding of heels and the production of dipped druggists' sundries.

American Rubber Manufacturing Co., Matson Building, San Francisco, Calif., has recently been making a considerable addition to the equipment of its factory at Park Ave. and Watt St., Oakland. The company has been enjoying a large and growing business, its sales of heavy belting, hose, and general mechanical rubber goods for the past twelve months being the largest in its career. A large shipment was made during the past month to Sydney, Australia, of oil and gasoline hose to equip all the modern service stations being set up in Australia by the Union Oil Co. Col. J. L. Dodge, treasurer of the rubber company, has just returned from an extended business visit to the Southwest. Wm. R. Goudie, who for several years had been southern sales manager and had been recently promoted to the position of general sales manager and stationed at Oakland, has resigned. He has not yet announced his plans for the future.

United States Rubber Co. business in the Pacific Coast area during the past quarter has been excellent, according to Pacific Coast Division Manager J. B. Brady, and the prospects for the remainder of the year are considered very good. Mr. Brady has been unusually busy during the past month visiting the chief distributing points on the Coast and conferring with branch managers.

Pacific R. & H. Co., El Monte, Calif., reports a steadily-growing market for its output of standard reclaimed rubber and raw material in ample supply at fair prices, according to Works Manager F. S. Pratt. Enlarged equipment now enables the plant to turn out in excess of 10 tons daily.

Campbell Mfg. Co., managed by J. W. Campbell, 1360 W. Washington St., Los Angeles, Calif., which has been making upwards of 5,000 yards a day of round elastic cord for tire-cover makers on the Pacific Coast, is arranging to make also rubber-threaded tape for the garment trade.

Tire Fabric Exports for 1928

United States statistics of exports of tire fabrics to specified markets during the calendar year 1928 revealed that 4,742,000 square yards of cord fabric were exported, including 1,197,000 square yards to Canada and 5,000 square yards to South America. Other fabrics for tires were shipped to the amount of 1,668,000 square yards, of which Canada received 840,000 square yards, South America 15,000 square yards, and the Philippine Island 1,000 square yards.

Price Affects Rubber Imports

While American imports of crude rubber in 1928 were valued at $245,000,000, or less than one-half as much as in 1926, their value was also $95,000,000 less than in 1927, says *U. S. Commerce Reports.* The totals were largely affected by rubber prices, which averaged 55 cents in 1926, 36 in 1927, and 25 in 1928.

Obituary

Well-known Purchasing Agent

A SUDDEN and fatal heart attack robbed the Lee Tire & Rubber Co., Conshohocken, Pa., of its valued purchasing agent, Frank B. Wilson. He was returning home with his wife in their car from a moving picture performance on the night of April 20, when he was stricken.

Mr. Wilson was associated with Lee of Conshohocken for twelve years. Prior to this connection, he was with the United States Rubber Co., Bristol, R. I.

F. B. Wilson

He was born sixty years ago of a family whose ancestors had long ago settled in New England. He was an ensign in the naval reserve during the Spanish American War and was also captain of the Sons of Veterans of the Civil War. In the Masonic order Mr. Wilson was past grand high priest of the State of Rhode Island and also past master of the Blue Lodge, Bristol, R. I.

His wife, Emily Phelps Wilson; his mother, Mrs. Elizabeth H. Wilson, of Bristol; a daughter; and four grandsons survive him.

Funeral services were held at the Wilson home on April 23, with Rev. Stanley R. West, pastor of the Calvary Episcopal Church, officiating. Additional services were held on April 27 at Bristol, R. I. Interment was at North Cemetery in Bristol.

Veteran Goodrich Historian

THE oldest man, in point of service, among more than 20,000 employes of The B. F. Goodrich Co., Akron, O., suffered a stroke which led to his death on May 13. Percy W. Leavitt had more than forty-eight years of service with that rubber company to his credit. He began this association as an accountant working with Dr. B. F. Goodrich himself. During recent years Mr. Leavitt had held the honorary position of librarian, steadfastly declining to retire from active service. In 1910 he completed the compilation of a history of the company covering the forty years of its existence.

Mr. Leavitt was born in Boston, Mass., on August 21, 1855. He lived there until he came to Akron on December 29, 1880.

He was a past master of Adoniram Lodge, F. & A. M., past eminent commander of Akron Commandery, Knights Templar, past president of Masonic Club, and a member of Tadmor Temple, Yusef Khan Grotto, charter member of Portage Country Club, member of the Sons of the American Revolution, the New England Society of Cleveland, and the Cleveland Athletic Club. Golf was his hobby.

Mr. Leavitt is survived by his widow, two sons, a sister, and four grandchildren.

Funeral services were held on May 15. Burial was in Glendale Cemetery.

A Veteran Compounder

FREDERICK BARBER, who from boyhood had been active in rubber manufacturing and had rendered valuable service to many notable concerns, chiefly along compounding and production lines, died recently of arterial sclerosis at his home, 1277 Queen Anne Place, Los Angeles, Calif. He left his widow and one daughter. Burial was made in Inglewood Park Cemetery.

Mr. Barber was born in Akron, O., in 1870, and began his career with the Diamond Rubber Co., Akron. He spent four years with the Morgan & Wright Rubber Co., Chicago, Ill., and next started the Goshen Rubber Co., Goshen, Ind. Then followed two years with the Goodyear concern in Akron, after which he helped to launch the Falls Rubber Co., Cuyahoga Falls, O., and the McCreery Rubber Co., Indiana, Pa. When Mrs. Barber's health failed, he left the latter concern ten years ago and went to Los Angeles, first spending several years with the Eno Rubber Co. At the time of his death he was in charge of compounding at the plant of the W. J. Voit Rubber Co. and had practically worked out a novel vulcanizing formula.

James Meade

JAMES MEADE, president of the Meade Rubber Co., Stoughton, Mass., was stricken with a heart attack and died suddenly while on a short vacation trip in Maine. He had just reached Chain-of-Ponds Camp twenty miles north of Stratton, Me., on his annual spring fishing trip. His obituary and portrait will appear in our next issue.

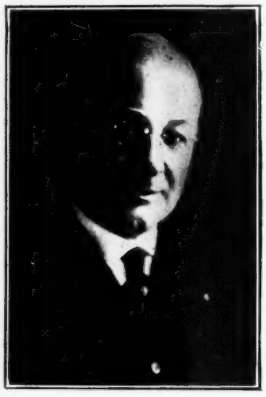
W. C. Volk

W. C. VOLK, who was connected with the sales department of the Republic Rubber Co., Youngstown, O., died suddenly last month. His obituary and portrait will be published in our forthcoming issue.

Prominent Head of Vaughn Machinery Co.

WHILE attending a birthday party in his wife's honor on May 11, Calvin W. Vaughn suffered a sudden and fatal heart attack. He was president of The Vaughn Machinery Co., Cuyahoga Falls, O., one of the oldest industrial plants in northeastern Ohio.

Mr. Vaughn was born on July 11,



Calvin W. Vaughn

1858. While attending high school, he began working part time in the machine shops of the Turner, Parks & Co., predecessor of the company of which he became head. His early ambition was to become a machinist and follow the example of his father, the late James A. Vaughn. Young Vaughn became an apprentice and learned the trade in his father's shop.

When James Vaughn died, his son inherited his interests in the Turner, Vaughn & Taylor Co. Calvin Vaughn bought out the interests of the others and was elected vice president in 1892 and became president in 1895. The name of the corporation recently was changed to The Vaughn Machinery Co.

Years ago the plant constructed machinery used in the manufacture of clay products. For several years, however, the product of the shop has been limited to machinery and equipment for chain works, rubber mills, and wire mills.

Mr. Vaughn was a 32nd degree Mason, member of the Al Koran Shrine at Cleveland, Lake Erie consistory, and the Akron commandery, Knights Templar. He also was a member of the Akron City, Portage Country, and Cleveland Athletic clubs.

Surviving are his widow, Mrs. Lucy Treat Vaughn; one son, Lee, who has been associated with his father in the machinery business; and one sister, Miss Laura Vaughn.

Funeral services were held on May 14, with Knights Templar in charge. Burial was in Oakwood Cemetery.

The Rubber Industry in Europe

GREAT BRITAIN

R. G. A. Annual Report

The annual general meeting of the Rubber Growers' Association was held at Headquarters in Idol Lane, London E. C. 3, on April 25, 1929. The Chairman, William Duncan, after reviewing the work of the Association, particularly regarding rubber roadways and propaganda work, turned to a discussion of the outlook for the future.

"With regard to the future of the rubber growing industry," he said, "I find myself unable to repress an inward feeling of optimism.

"The quantity of rubber kept off the market during the six years of restriction, amounted to roughly 350,000 tons. The total world stocks on October 31, 1928, were about 20,000 tons higher than they were at October 31, 1922, when restriction was first imposed. The world's consumption in 1922 was 390,000 tons, in 1928 it was 680,000 tons. The world stocks (which, of course, include all stocks on estates, in transit, afloat, in warehouses, at the ports, and in manufacturers' hands) represented 10 months' consumption at the end of October, 1922, and six months' consumption at the end of October, 1928.

"These figures reveal a satisfactory improvement in the position as regards the relation of stocks to consumption and a phenomenal increase in actual consumption.

"The motor industry absorbs some 80 per cent of the world's rubber production, and the motorization of the world is progressing by leaps and bounds."

Continuing with regard to the progress in motor transportation, he added, "The countries of Europe are gradually recovering from the disastrous effects of the war, and as their purchasing power increases, so inevitably will their demand for cars. Most countries of the world, especially the economically backward countries, are planning and carrying out extensive programs of road development."

Cooperative Selling

At the meeting, W. C. E. Gibson made the following resolution:

"That it is advisable in the interests of producers to endeavor to establish a cooperative selling organization, and that a committee be formed to investigate the practicability of drafting a scheme for the approval of this Association."

Sir George Maxwell suggested that the first part of the resolution should be deleted, leaving the meeting to decide on a recommendation that a committee be formed to investigate the practicability of drafting a scheme for establishing a cooperative selling organization for the approval of the Association.

The amendment was accepted and the motion was then carried.

The New Chairman

On the motion of Mr. Duncan, seconded by W. Forsythe, G. H. Masefield was elected chairman for the coming year. J. G. Hay, who was absent in the Far East, was elected vice president.

Propaganda Work

During the year under review, the Association participated in thirteen exhibitions, ten in the United Kingdom and the others in Canada, Leipzig, and Lyons, respectively. The exhibition in Canada was so successful that it is planned to arrange another exhibition there in 1929. Besides this, the program for the coming year also includes a number of important exhibitions on the Continent. To draw even greater attention to the Association's exhibits, a film entitled "A Day of Enlightenment," dealing with the various applications of rubber, has been prepared. During the year two handbooks, *"Rubber Flooring"* and *"Latex,"* were published in English and French and widely distributed. In addition, the handbooks *"Rubber and Engineering," "Rubber and Footwear," "Rubber and Textiles"* were translated into French, German, Spanish, and Italian, while *"Crepe Rubber Sole"* was also translated into Portuguese and Czecho-Slovakian.

The successful advertising campaign for rubber Wellingtons has led to discussions with manufacturers on the subject of cooperative publicity for rubber flooring, rubber belting, and rubber hot water bottles.

Rubber Manufacturers' Association

The luncheon and annual meeting of the India Rubber Manufacturers' Association was held on April 22, at Manchester, Mr. Hinde, managing director of the Avon India Rubber Co., Ltd., presiding. Mr. Hinde, who has recently returned from a visit to the Federated Malay States, in the course of his reply to the toast stated that through the courtesy of the Dunlop Rubber Co., he was able to spend two days on their plantations in Malacca where he saw a new clearing of 6,000 acres, all of which is to be shortly bud-grafted. While recognizing the enormous possibilities of budded rubber, the chairman gave his opinion that it would be some years before bud-grafting would affect the market price. He doubted whether at the present time there was in existence 10,000 acres of mature budded rubber, and he was rather surprised to find that most of the pioneer work in this direction in Malaya had been done on plantations owned by manufacturing concerns, namely the Dunlop Rubber Co. and the General Rubber Co. of America.

Turning to the annual report, Mr. Hinde remarked that competition in almost every branch of the industry was becoming daily more severe. The margin between factory cost and selling price had never been lower, nor the necessity for cooperation between manufacturers to protect their own interests greater than it is today. He was convinced that in time rubber manufacturers would realize more and more the value of an association backed by a vigorous policy. It was now two years since tires had been safeguarded, and the result had been powerful organizations by Goodyear, Firestone, Michelin, India and Pirelli, all of whom had erected their own plants in the United Kingdom. From the point of view of trade of the country as a whole, he was inclined to think that this was for the common good, but the inevitable effect would be the intensifying of competition among themselves.

Comparative Costing

Continuing, the Chairman said that for some time past the general committee had been taking up the question of comparative costing in the rubber trade, and that Price, Waterhouse & Co., the American-London firm of chartered accountants, were giving advice in this regard. This concern had examined the costing systems of a number of the leading firms in the industry and had submitted a detailed report in which they pointed out that a standard system of costing for the rubber manufacturing industry is possible and desirable. The cost accountants of a number of the leading firms in the rubber industry are to meet shortly to form a subcommittee to discuss with Price, Waterhouse & Co. the best method of securing throughout the industry the general application of a common costing system, and the work is being pushed as rapidly as possible.

Price Fixing

Referring to remarks regarding prices made by Mr. Flanagan in his speech, the Chairman stated that a few days prior to the meeting, some general committee members of the Association had met in London and after very careful consideration it had been decided during the current year to push forward a much more determined program of price fixing than it had been possible to carry through in previous years. With the active cooperation of all the members there was no reason why very valuable work should not be done in this direction, and the general committee was determined that something of the kind should be done during the ensuing twelve months.

The Dunlop Rubber Co.

From the annual report of the Dunlop Rubber Co., Ltd., it is learned that the directors have withdrawn £1,500,000 from the general reserve fund to meet losses resulting from the removal of rubber restriction, and after crediting this amount, the profit and loss account shows a profit of £2,859,894. This compares with £2,953,424 in 1927 when no transfer was made from reserve.

Dividends on the preferred shares of the Dunlop Cotton Mills, Dunlop Plantations, and Dunlop Rubber Co. (India), Ltd., were paid to the amount of £309,750, and interest on debenture stock, debentures, income stock, and loans absorbed £412,237, leaving a net balance of £2,137,907. To this must be added the £578,580 carried forward from the previous year, which brings the balance up to a total of £2,716,487. Dividends on the A, B, and C preferred issues absorb £370,000, and in addition a 20 per cent dividend has been declared on the ordinary shares (against 25 per cent in 1927), which will take up £1,540,209, leaving a balance of £801,277 to be carried forward to the next account.

At the forthcoming meeting, it is learned, the directors will seek authority to issue an additional 3,000,000 ordinary shares of 6 shillings 8 pence each.

The company, which is the second largest producer of crude rubber in the world, owns big estates in Malaya which can produce over 16,000,000 pounds of rubber per annum. In their report the directors state that the sudden removal of restriction caused an immediate serious drop in the price of crude rubber which necessitated writing down the value of stocks. Further, as is almost inevitable, the selling prices of the finished goods were reduced following the trend of the market price of the crude article before the actual price paid by manufacturers had reached a similar level.

However, the company is now through the difficult period and reports that the volume of business at home and abroad is satisfactory. Efficiency both in the factories and on the plantations is of the highest. To meet the rapidly growing demand for giant pneumatics, additional machinery is being provided and greater use is being made of the Macintosh group of factories in the production of both solid and pneumatic tires. This group is showing increasing profits.

The company's cotton mills are fully employed and costs are the lowest so far attained. The American company is working with great efficiency and its products are of the highest quality. While it shows no profits for 1928, there is good reason to expect that these will be forthcoming in 1929.

The Rapson Tire & Rubber Co. (Australia), Ltd., Launceston, Tasmania, **which had been meeting with success, recently experienced a very severe flood caused by the swollen rivers of Tasmania. The company, however, is recovering from the damages and soon will be functioning with its former efficiency.**

GERMANY

Unfavorable First Quarter

The unusually severe and long winter has at last come to an end and more than one manufacturer views the first quarter of 1929 with feelings of discouragement. While the year apparently started in well enough and orders were satisfactory, the sudden and extremely cold weather that set in just at the time when preparations were being made to meet spring orders upset all plans. Some business men go so far as to say that even if the rest of the year shows a favorable turnover, this will not be enough to offset the damage caused during the first three months of the year.

The first result of the zero weather was to send up the price of coal and in many cases an actual shortage was experienced. Not only this, but frost and snow made transportation difficult and added to the increased cost of the coal, higher transportation charges, to say nothing of delays. In addition, the water supply was seriously affected and those factories that were lucky enough to escape this, found that their expenses were considerably added to by the necessity of extra precautions to prevent the water pipes from freezing.

Production was further affected by the large percentage of workers that were laid up with influenza and other troubles due to the weather. As a result of all this, not only have costs worked out much higher than normal, but production for a period of six weeks is but a fraction of what it usually is for the time of the year. To crown all, orders were fewer, so that many a firm has found that in spite of decreased production, stocks have increased.

Complaints about slow payments are louder than ever, while prices continue low. It has been figured out that while the average cost of living at present is 160 per cent of prewar standard, surgical rubber goods are actually below the prewar average. And this notwithstanding that taxes are so much higher, and that wages are being constantly raised, to name but two items.

Chemists and Engineers Meet

This year the general meeting of the Deutsche Kautschuk Gesellschaft (Scientific Association of German Rubber Chemists and Engineers) took place on May 12, 13, and 14 in Hannover. Among those who read papers were Dr. Staudinger, Dr. Pummerer, Dr. Hauser, Dr. Kirchhof, Director Lindemann, Ing. Deutsch, Dr. Auer, and M. Mohr.

Solid Tires

As is known, the government had decided on March 16, 1928, that by July 1, 1929, solid tires on motor trucks, must, with a few specified exceptions, be replaced by pneumatic tires. Now it is learned that the National Association of German Owners of Motor Trucks have appealed to the government to postpone the date and change it to December 30, 1930. It is claimed that it is impossible to complete the required change by the expiration of the earlier date.

Another Continental Fusion

Last month the fusion of the Peters Union with the Continental Caoutchouc und-Gutta-Percha Compagnie, Hannover, was reported in these columns. Now it is learned that the Gummiwerk Titan, B. Polack A. G., Waltershausen, with which concern the Continental has been negotiating with a view to amalgamation, is to propose at its forthcoming meeting in June. to turn over its property in its entirety to the Continental as from January, 1928. The Titan concern would be guaranteed 1,575,000 marks of Continental shares against 2,100,000 marks of Titan shares. It seems that there is no plan to increase Continental company's capital for the purpose of consummating the amalgamation. So far this is the third concern that has joined with the Continental, the other two being Peters Union, as mentioned above, and Excelsior.

Rubber Novelties

Mention is made in a recent issue of the *Gummi-Zeitung* of some attractive novelties made entirely of rubber or employing rubber in some way. To the latter type belongs a combination bracelet and cigaret holder. At present the cigaret holder is made of ivory in small sections strung on a varnished rubber-band and in this form it is an attractive bracelet. When the wearer wishes to smoke, the bracelet is removed and the sections are screwed together to make the cigaret holder. It is naturally suggested that the sections could just as well be made of hard rubber.

Rubber scarfs worn at the wrists are also mentioned. These are made of very thin rubber in colors to match the evening gown of the wearer. The material resembles chiffon and is fastened to the wrist with a big bow. The scarfs could be used as fans and it is said that they are preferred to scarfs of chiffon because they are pleasantly cool and at the same time do not become unsightly in the course of the evening as real chiffon does.

At the beaches hard rubber cases for watches and cigarets are being used a good deal. These cases have devices which permit them to be easily attached to the garment of the wearer. They close hermetically and are therefore watertight.

Imports of Crude Rubber

During the first three months of 1928 Germany imported 8,990 tons of crude rubber, while in 1929 this amount increased to 13,910. It is to be noted however, that whereas last year the imports show an increase month by month, the process is the other way round this year and each succeeding month showed a slight decrease as compared with the month before.

The Rubber Industry in the Far East

MALAYA

Large Shipments and Stocks

Two questions are occupying rubber men at present, namely: Are the large shipments that have been coming from Malaya month after month due to unexpectedly large hoarded stocks that are now being released, or must the world count on a production from Malaya amounting to something like 35,000 tons a month? In the latter event the unpleasant prospect has to be faced of having production greatly exceed consumption and all that that entails, unless something is done about it.

A. W. Still, writing on the subject in the *Straits Budget*, says that he made a calculation to see what it would mean if Malaya went on producing at the January-February rate. Taking the generally accepted forecasts of production in the Dutch Colonies, Ceylon, and other producing areas, including wild, he found that exports in the first two months of the present year were equal to a rate per annum of 906,468 tons, which is about 200,000 tons above the soundest forecast for consumption. On the January-February basis, Malayan production would be 487,848 tons in 1929, which is about 140,000 tons above the average estimates.

His own view of the matter, however, is that the hoarded stocks were considerably in excess of estimates, and that the last of them may not be shipped before the end of April. In any case he doubts whether anything like an accurate forecast of free production can be made before July or August. His own impression is that for about nine months in 1928, restriction, except for the control it exercised over exports, was ignored, and that about twice as much rubber was being harvested as was shipped. On this basis the excess over exports at the end of October, 1928, would be about 116,000 tons, and if 30,000 tons a month is taken as Malaya's free production capacity, the excess shipments to the end of February amount to 79,987 tons and the balance of the hoarded stock still to be shipped is 36,904 tons, which may be expected to come to hand at the rate of about 12,000 tons per month during March, April, and May. From this point of view, of course, actual production would turn out to be very much below the figures suggested by the January-February shipment.

South American Leaf Disease

In the first number of the *Quarterly Journal* of the Rubber Research Institute of Malaya, which has just appeared, Dr. Weir, head of the Pathological Division of the Institute, warns the rubber industry to guard against the introduction of the fungus, *Dothidella Ulei*, which causes the South American leaf diseases. Any attempt to import into Malaya superior races of rubber from South America should be entrusted to thoroughly competent investigators.

The peculiar danger of importing a disease lies in the fact that plant diseases which have become epidemic and most difficult to control or eradicate have been those introduced from foreign countries. The fungus of the South American leaf disease selects no other host than Hevea and while it causes little or no damage to wild rubber in the Amazon Valley, owing to the protection of the dense jungle and the fact that Brazil has a distinct dry season covering a period of six months, conditions in pure stands seem to be very favorable to the development of the fungus. This is the case in Malaya, where not only is there no distinct dry season but there is also a continuous stretch of rubber running almost the entire length of the peninsula, so that once the fungus got a foothold in this country there would be very little to impede its progress.

Dr. Weir points out that a study of the various forms of Hevea in the Amazon has never been carried out successfully. This would be worth while for the purpose of isolating a type that would combine resistance to the blight and high yielding capacity.

He further states that while much progress has been made in improving yields during the past few years, little attention has been paid to immunity and resistance to disease. Yet it was the leaf disease that wiped out the rubber plantation industry in the Guianas, where observers found certain trees that were immune to the blight. In India some trees are immune to leaf fall, and in Ceylon some trees are naturally immune to bark rot.

It is on the program of work to find trees resistant to disease, and it is proposed to establish a special test-garden for the accumulation and intensification of local pathogens in soil and trees for the purpose of emphasizing the survival of the fittest through the elimination of non-resistant individuals.

A Restriction Verdict

With the restriction period in the past, opinion as to its value becomes more restrained, and therefore more interesting. An example is in the recently published report of the Malacca Planters' Association, which says:

"The year under review has been a momentous one, and 1928 will go on record as one of the critical periods in the history of plantation rubber. The rubber producing industry has passed through the easy-money stage, when rule of thumb methods were good enough to insure profits. We hope it has left behind it forever the adolescent stage which called for the protection of government-controlled restriction. There can be no doubt that during that period scientific progress marked time. We were working short time without incentive and becoming debilitated by the narcotic effects of restriction. The first two years of restriction were helpful by allowing time to recover from the effects of overtapping and wrong methods of horticulture. Its penultimate year proved dangerous and its last year frankly disastrous to Malaya's place of supremacy among rubber-producing countries. The final and drastic reassessment of standard production eighteen months ago proved to be the last straw which broke the back of restriction. As planters we are again working at full pressure under the stimulus of competition."

Wage Rates for Coolies

The same report mentions the standard rates for coolies employed on estates in Malaya. These are: Province Wellesley, 50 cents for men and 40 cents for women; Inland Pahang, 58 cents for men and 46 cents for women; Coast Districts, 50 cents for men and 40 cents for women. So far no standard rates have been fixed for Malacca, but the announcement that all licenses accepted after February 1, last, must bear minimum rates of 50 and 40 cents, combined with rates now ruling in Selangor and the Province, will gradually bring Malacca into line. In some quarters the Indian Immigration Committee has been blamed for forcing the issue of increased wages when prosperity in the rubber industry was at its lowest ebb. The fact is that for some districts the rates had been fixed as far back as 1927, and the Government of the Federated Malay States and of the Straits Settlements had definitely accepted, at the request of the Indian Government, the principle of fixed standard rates. So that the Indian authorities could say the matter had been delayed too long, and that if the necessary standard rates were not fixed for the remainder of the Malayan Districts, they would be in a position to curtail immigration by the operation of the Sex Ratio Law. At the same time it is realized that an upward tendency in wages is inevitable, and in the case of the Tamil coolie, the care given him on estates is raising his standard of living and efficiency.

Company News

Bukit Kepong Rubber Estates, Ltd. At the annual general meeting the chairman stated that negotiations were being carried on with a view to amalgamation. "Amalgamation appears to be the order of the day and your directors have various proposals under consideration," he said, "but these have not yet reached a concrete form." Bukit Kepong is able to report low costs and satisfactory yields, which in consideration of the

improved outlook for rubber, enables the company to declare a 10 per cent dividend.

The Balau Planting Syndicate declared a dividend of 10 per cent. The all-in cost was 6.92 pence per pound as compared with 10.54 pence per pound the year before. The company has sold forward forty tons for delivery November-December at 8⅞ pence per pound, f. o. b. Port Swettenham, and sixty tons to be delivered ten tons monthly during January-June, 1929, on similar terms. No other contracts have been made.

NETHERLANDS EAST INDIES

Native Rubber

In all calculations regarding the future of rubber, the vexatious point has generally been native rubber, for the planting, harvesting, and marketing of native rubber so differs from European methods that it is difficult to estimate what part this product would play under given conditions. Considering that the average price of crude rubber during 1928 was the lowest in the last five years, figures for native output and details regarding native activities during the year assume a peculiar significance. An outstanding fact is that despite the low price ruling in 1928, native rubber exports were not much less than in 1927. When the price is considered, it is safe to assume there was comparatively little smuggling during the year. One is led to believe that native shipments were equal to if not in excess of 1927 shipments.

An illuminating article on native rubber in Dutch Borneo in 1928 is contributed from Bandjermasin to a Java paper. The condition of trade in Borneo is closely related to the prosperity of the native rubber growers, and business was consequently affected adversely by the drop in prices in April, 1928, when the abolishment of restriction was announced. The standard of living, which had gone up considerably owing to the period of good prices for rubber, continued to be fairly high, although it was noticed that in the Ulu Sungei district, which is the native rubber center, there was a marked lowering of the standard.

It is stated that owing to the depression in Ulu Sungei about 5,000 natives migrated to other sections, chiefly the East Coast of Borneo. The brokerage firm of Dunlop & Kolff in Bandjermasin was forced to close in July, 1928. Large numbers of natives took up harvesting jungle products again, and fair quantities of jelutong and other forest products were exported.

The Chinese middlemen, who also export native rubber, held aloof during part of the year and three failures were reported, one firm being considered the largest exporter in Dutch Borneo. It is only fair to add that speculation had a great deal to do with the difficulties of the firms that failed.

As though the low prices and consequent greater difficulty of selling rubber were not enough for the native planters, many trees were destroyed by lalang fires, others succumbed to rough tapping, while many trees planted along the canals to the Dayak territory were lost in the rainy season by floods, and in the dry season by forest fires.

As a result of these unfavorable events, there was a drop in the quantity of native rubber exported, but, as the figures show, the decrease was inconsiderable, from 23,800,000 kilos in 1927 to 23,000,000 kilos in 1928.

Despite the low prices prevailing during three-quarters of 1928, it evidently paid the natives to tap. However, the usual system by which the owner and tapper share the crop had to be abandoned, temporarily at least, because of the small profits, and tapping was carried out by the owner, his family, and relatives. It must be added here that many owners of rubber lands, who had made good profits during the period of high prices, had invested practically everything in additional rubber fields; consequently they had to tap whether they liked it or not.

Another interesting fact brought out was that while the European and Japanese estate owners in Borneo did not expand their acreages to any extent worth mentioning, the natives have continued to plant new land all through 1928, particularly in Martapoera, Ulu Sungei, and Kloea.

In considering native rubber in general, it has to be borne in mind that owing to the regulations regarding the preparation of rubber now being enforced by the Dutch Colonial Government, especially in Djambi, the moisture content of the product will be much lower than before. Also, increasing quantities of the output are being converted at the remilling factories in the Dutch East Indies so that figures for wet and dry rubber from the Dutch colonies will have to be scrutinized more carefully.

South East Borneo Estates

The average review of conditions on rubber estates in the Dutch Colonies is generally restricted to Java and Sumatra, because the greater number of European enterprises are located in these islands, and European rubber cultivation in other parts of the Dutch East Indies is almost negligible by comparison. Nevertheless, data regarding the development of the industry in the less well-known parts are welcome.

Besides the fairly extensive native industry in Dutch Borneo there are also a fair number of European and Japanese estates. Oddly enough most of these enterprises have been started with foreign capital. There are estates owned by English, Germans, Japanese and Arabs, but very few by Dutch. Apparently the latter prefer the safer investments offered in Java and Sumatra. A writer in a Soerabaia paper gives interesting data regarding these estates, going into special detail in the case of the Tanah Intan estate, the property of the Martapoera Rubber Co., London. This is the oldest European estate in the territory under discussion, having been started in 1906. The Japanese did not enter the rubber field here until 1918 when the owners of the Dutch Borneo Rubber Co., Ltd., acquired Danau Salak, Zeeland, and Atajoe. One of the youngest enterprises is Lok Tabet, owned by F. H. Hanfland.

The Tanah Intan estate has an area of 1,900 bouws (bouw equals 1.74 acres) of which 1,000 is planted and 700 have reached the tapping stage. The estate is run efficiently, expansion takes place regularly, and just as regularly production is increased and costs cut. Tapping is particularly good, the tappers having been well trained in keeping bark consumption low so that the maximum per tree does not exceed 9 inches per annum. This makes it possible to tap low down, which results in higher yields, because the tapping cut can safely be made longer and the flow of latex increases the lower down on the tree the tapping cut is made. With this system, too, there is hardly any brown bast trouble.

Speaking of diseases, pink disease gives the most trouble, on the other hand mildew, which is a great cause of worry in Java, and stripe canker are unknown.

Although there are no experiment stations in Borneo to guide the estates in improving methods of cultivation, nevertheless the better estates are said to be not one whit behind Java. Thus Tanah Intan began bud-grafting on its own initiative many years ago and now has 3,000 budded trees, which are tappable. The results are said to be surprisingly good. Tanah Intan is not the only estate here that has started budding. On the contrary, all the estates in the Martapoera district have taken up this method of improving their material and the success obtained at Tanah Intan cannot but encourage those that started later.

What may be termed a disadvantage under which estates labor in Borneo is the peculiar fact that it has so far seemed practically impossible to start another crop besides rubber. Thus Tanah Intan tried coffee and oil palms to offset low rubber prices in periods of depression, but these proved failures. Other estates have obtained results no less discouraging. Indeed, old and experienced planters, who had tried to grow coffee and other crops with their rubber, have long since given up the attempt and are concentrating on increasing the yield of rubber and reducing the costs.

The final verdict of the rubber industry in Borneo, as far as the European enterprises are concerned, is that all along the line this branch is in a sound and robust condition, that in coming years a considerable increase in production from this source may be expected, and that the high efficiency prevailing will enable the estates to weather periods of lower prices.

The Netherlands Rubber Union

It is announced that the director of the Netherlands Rubber Union, G. Romer, has just arrived in the East with the purpose of reopening the rubber remilling factory at Bandjermasin, Borneo, that it was forced to close about a year ago. It seems that the Rubber Union has been moved to undertake this step because of the improved conditions and better outlook for the rubber industry.

Rubber Patents, Trade Marks and Designs

Machinery Patents

United States

1,708,123.* RUBBER SCRAP GRINDER. An important feature of this invention is its provision permitting the introduction of low pressure steam which serves to encompass the stock and prevent its ignition by the heat of grinding. The steam is injected at such points in the system as are subject to ignition trouble and allowed to pass forward from the points of injection with the charge of stock.—H. G. Day, Akron, O., assignor to The Philadelphia Rubber Works Co., Wilmington, Del.

1,709,266.* RUBBER SPREADER. In this compactly arranged machine the rubber mass for coating does not require to be replenished during the coating of one roll of fabric. The distances between the spreader roll and knife, the drying pipes and the wind-up are greatly reduced. Also the coated side of the fabric faces the steam pipes located on the floor under the machine.—E. J. Hooper, Nutley, N. J.

1,709,796.* INNER TUBE MACHINE. By this invention, means are provided for constructing endless circular tubes for vulcanizing, comprising forming endless flat bands of unvulcanized rubber and shaping them to the shape of the inner half of the tube then uniting the bands along their edges.—O. J. Kuhlke, assignor to The Kuhlke Machine Co., both of Akron, O.

1,709,921.* HYDRAULIC PRESS. This invention relates to the type having a tilting die-carrying head. It provides an improved attachment easily applicable to a press with a fixed head and a movable ram, which will convert such press into one of the tilting-head type.—T. F. Stacy, assignor to The French Oil Mill Machinery Co., both of Piqua, O.

*Pictured in group illustration.

1,709,942.* TUBE CUFFING MACHINE. Cured inner tubes are removed from mandrels by a roller mechanism which impels the mandrel forward and out of the inner tube, the end of which is turned back upon itself in the form of a cuff and inflated at that point. The manual operations are reduced in number and rendered less laborious.—C. W. Leguillon, Akron, O., assignor to The B. F. Goodrich Co., New York, N. Y.

1,710,211.* SHEET CUTTING MACHINE. This invention provides means for cutting unvulcanized rubber thread from rolls of refrigerated sheet stock and conducting the thread in non-adhering bundles to a water-curing vulcanizer for curing.—J. R. Gammeter, Akron, O., assignor to A. G. Spalding & Bros., a corporation of N. J.

1,711,058.* TUBE STRIPPING MACHINE. This device is one by which inner tubes may be stripped from straight pole mandrels upon which they are cured expeditiously, economically, and with a minimum handling of the mandrels.—P. W. Lehman, Milwaukee, Wis., assignor to The Fisk Rubber Co., Chicopee Falls, Mass.

1,711,473.* TIRE FINISHING MACHINE. On this machine a tire may be supported and driven circumferentially while the various finishing portions, including the side wall and chafer strips, are progressively applied by devices arranged to act upon the driven tire. An improved presser stitcher for shaping the parts on the tire side wall is also provided.—E. D. Putt, assignor to The Firestone Tire & Rubber Co., both of Akron, O.

1,711,475.* INNER-TUBE STRIPPER. The general purpose of this invention is to provide an apparatus for effectively and automatically stripping inner tubes from straight mandrels. It is operable by a single operative.—H. D. Stevens. assignor to The Firestone Tire & Rubber Co., both of Akron, O.

1,708,049. WINDING MACHINE. H. E. Bryant, Providence, assignor to Tubular Woven Fabric Co., Pawtucket, both in R. I.

1,708,129. BAND MAKING APPARATUS. J. R. Gammeter, Akron, O., assignor to The B. F. Goodrich Co., New York, N. Y.

1,708,358. TIRE REPAIR VULCANIZING STAND. J. Comber, assignor to National Equipment Co., both of Akron, O.

1,708,644. BEARING. L. Wetmore, assignor to The Goodyear Tire & Rubber Co., both of Akron, O.

1,708,971. LASTING JACK. T. M. Knowland and A. Drechsler, assignors to Hood Rubber Co., all of Watertown, Mass.

1,709,797. PUNCTUREPROOF TUBE MANUFACTURE. O. J. Kuhlke, Akron, O.

1,709,810. COLLAPSIBLE CORE. I. J. Remark, assignor to The General Tire & Rubber Co., both of Akron, O.

1,710,804. TIRE RETREADING MOLD. F. L. Smith, J. S. Caufield and C. J. Peterson, Sacramento, Calif., assignors to The Super Mould Co., Reno, Nev.

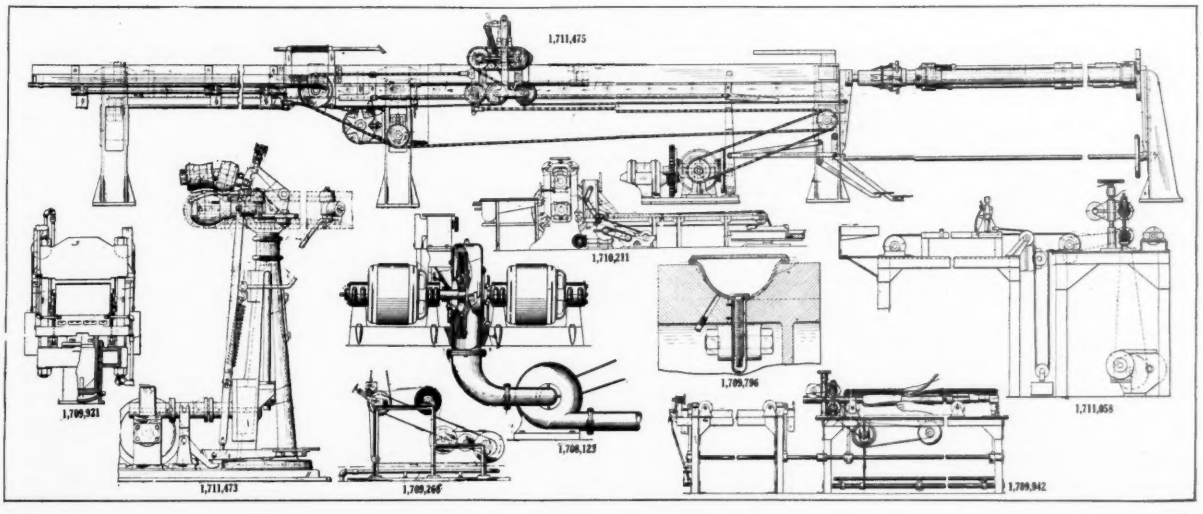
1,711,014. BLOW-OUT SHOE. A. H. Cooper, Atlanta, Ga.

1,711,057. BEAD SETTER. P. W. Lehman, Milwaukee, Wis., assignor to The Fisk Rubber Co., Chicopee Falls, Mass.

1,711,072-1,711,073-1,711,074. TIRE BUILDING MACHINE. G. F. Wikle, Milwaukee, Wis., assignor to The Fisk Rubber Co., Chicopee Falls, Mass.

1,711,460. COLLAPSIBLE CORE. I. J. Remark, assignor to The General Tire & Rubber Co., both of Akron, O.

1,711,474. TUBE CUFFING DEVICE. H. D. Stevens, assignor to The Firestone Tire & Rubber Co., both of Akron, O.



Rubber Patents, Trade Marks and Designs

Dominion of Canada

288,453. Work Support. The Dunlop Rubber Co., Ltd., London, N. W. 1, assignee of H. Willshaw, W. A. Davis and H. Smith, Birmingham, all in England.

288,860. Tapered Plug for Mandrel. The Goodyear Tire & Rubber Co., Akron, O., U. S. A., assignee of J. R. Hunter, Wolverhampton, Co. of Stafford, England.

288,861. Mandrel Tube Cutter. The Goodyear Tire & Rubber Co., assignee of E. C. Kastner, both of Akron, O., U. S. A.

288,862. Tire Bead Manufacture. The Goodyear Tire & Rubber Co., assignee of R. S. Kirk, both of Akron, O., U. S. A.

288,956. Inner Tube Manufacture. J. R. Gammeter, Akron, O., U. S. A.

United Kingdom

305,118. Tire Mold. Lambert Tire & Rubber Co., Barberton, assignee of J. W. Brundage, 722 Wellesley Ave., Akron, both in O., U. S. A.

305,152. Extruding Plastic Material. Dunlop Rubber Co., Ltd., 32 Osnaburgh St., London, and F. Fellowes, Fort Dunlop, Birmingham.

305,264. Coating Fabric. C. Macintosh & Co., Ltd., S. A. Brazier and J. D. Campbell, 2 Cambridge St., Manchester.

305,306. Sheet Rubber Cutter. C. Macintosh & Co., Ltd., and J. D. Campbell, 2 Cambridge St., Manchester.

305,329. Tennis Ball Machine. C. Macintosh & Co., Ltd., H. C. Young and J. D. Campbell, 2 Cambridge St., Manchester.

305,394. Tire Mold. E. C. R. Marks, 57 Lincoln's Inn Fields, London.—(Nestler Rubber Fusing Co., Inc., New York, N. Y., U. S. A.)

305,529†. Tire Construction Web. Goodyear Tire & Rubber Co., 1144 East Market St., assignee of B. Darrow, 880 Hereford Drive, both of Akron, O., U. S. A.

305,531†. Rubber Mold Cleaner. Goodyear Tire & Rubber Co., 1144 East Market St., assignee of G. G. Andrews, 1631 Battery B, both of Akron, O., U. S. A.

305,650†. Tire Flap Apparatus. Goodyear Tire & Rubber Co., 1144 East Market St., assignee of F. E. Ensley, 381 Watson St., both of Akron, O., U. S. A.

305,908. Boot Mold. A. A. Glidden, 65 Adams Ave., H. G. Ellis, 42 Lawrence St., both in Watertown, and H. L. Davis, 25 Robbins Rd., Walpole, all in Mass., U. S. A.

†Not yet accepted.

306,041†. Hose Making Machine. H. Pahl, 41 Am Gatherhof, Rath, Dusseldorf, Germany.

306,276. Ornamenting Sheet Rubber. Broadhurst & Co., Ltd. and W. J. Dexter, Gibbon St., Bradford.

306,371. Mixing Machine. F. H. Banbury, Ansonia, Conn., U. S. A.

306,528.† Tire Balance Tester. Goodyear Tire & Rubber Co., 1144 East Market St., assignee of H. T. Kraft, 267 Storer Ave., both of Akron, O., U. S. A.

306,555†. Cord Strength Tester. Goodyear Tire & Rubber Co., 1144 East Market St., assignee of M. L. Kochheiser, Tallmade, and S. A. Steere, 190 Casterton Ave., all of Akron, O., U. S. A.

Germany

Designs

1,067,088. Heel-Attaching Device. Westland Gummiwerke, G. m. b. H., Bredenscheid i. W.

1,067,650. Footwear Repair Vulcanizer. Karl Pelichower, Vienna. Represented by Dr. Schack, Berlin C. 2.

1,068,095. Tire Vulcanizer. The Dunlop Rubber Co., Ltd., London. Represented by Dr. R. Wirth, C. Weihe, Dr. H. Weil, M. M. Wirth, Frankfurt a. Main, and T. R. Koehnhorn and E. Noll, Berlin, S. W. 11.

1,068,840. Tire Testing Device. Kurt Thiele, Spreestrasse 42, Berlin-Charlottenburg.

1,069,988. Tire Repair Device. Gustav Janssen, Konigswinter.

Process

United States

1,708,059. Flexible Window Guide. R. T. Griffiths, assignor to The Miller Rubber Co., both of Akron, O.

1,708,111. Fiber Composition. H. L. Trumbull, Akron, O., assignor to The B. F. Goodrich Co., New York, N. Y.

1,708,141. Rubber-Lined Tube. I. F. Kepler, Akron, O., assignor to The B. F. Goodrich Co., New York, N. Y.

1,708,181. Rubber Goods Manufacture. P. Klein and A. Szegvári, Budapest, Hungary, assignors to The Anode Rubber Co., Ltd., London, England.

1,709,209. Reenforced Endless Belt. J. R. Gammeter, Akron, O., assignor to The B. F. Goodrich Co., New York, N. Y.

1,709,511. Paper Hood Cap. W. L. Wright, assignor to Oswego Falls Corp., both of Fulton, N. Y.

Dominion of Canada

288,369. Pneumatic Tire. J. R. Gammeter, Akron, O., U. S. A.

289,057. Shoe Manufacture. The B. F. Goodrich Co., New York, N. Y., assignee of F. Wray, Akron, O., both in the U. S. A.

United Kingdom

305,190†. Inflatable Hollow Article. L. and I. Dorogi, and Dorogi Es Tarsa Gumming R.-T., 30 Albertfalva, Budapest.

305,568†. Inflatable Rubber Article. L. and I. Dorogi and Dr. Dorogi És Társa Gummigyar r. t., 50 Albertfalva, Budapest.

305,577†. Vulcanizing Process. General Carbonic Co., assignee of H. R. Minor, both of 17 West 46th St., New York, N. Y., U. S. A.

305,735. Brush. F. A. Leeson, Tours, The Avenue, Chobham, and L. A. Kohler, Miram, Goldsworth Rd., Woking, both in Surrey.

Germany

475,768. Seamless Occlusive Pessaries. Carl Erwin Martin, Oeserstrasse 23, Leipzig-Schleussig.

Chemical Patents

United States

1,709,241. Moldable Composition. A molding composition comprising the product obtained by blowing in a current of air under the influence of heat, an admixture including an asphalt, an oil flux, and rubber.—H. A. Winkelmann, assignor to Philadelphia Rubber Works Co., both of Akron, O.

1,709,242. Composition. The product resulting from blowing with air under the influence of heat of an admixture containing a petroleum oil flux, a pine tar, an asphalt, and vulcanized rubber.—H. A. Winkelmann, assignor to Philadelphia Rubber Works Co., both of Akron, O.

1,710,100. Reclaiming Process. The process of reclaiming fiberized and vulcanized rubber which includes grinding the stock, incorporating therewith a plasticizing ingredient, milling the plasticized stock with a sufficient quantity of a reclaiming reagent, and subjecting the stock to the action of steam under pressure.—J. J. Moriarty, assignor of 30 per cent to J. H. S. Kerr, both of Toronto, Canada.

1,710,470. Liquefied Rubber Composition. A liquefied composition consisting of the reaction products of rubber and a suitable solvent, selected from a group consisting of benzol, toluol, and carbon tetrachloride, the combination containing substantially all of the condensable products obtainable upon boiling crude rubber dissolved in the solvent, at temperatures between 100° C. and 120° C.—H. P. Butler, New York, N. Y.

1,710,481. Reenforced Rubber. A vulcanizable product consisting of 100 parts of rubber, 3 parts of sulphur, 26.5 parts of zinc oxide, and 26 parts of aluminum oxide in extremely fine division, together with an appropriate quantity of an accelerator.—H. H. Keller, Ventnor, N. J.

1,710,617. Accumulator Plate. The pasted plate is coated with a mixture composed of rubber latex in admixture with a soluble salt. It is then allowed

to dry and the soluble salt washed out leaving an elastic and porous structure.—W. Haddon, London, and J. McD. Burnett, Weston-by-Welland, both in England.

Dominion of Canada

288,452. VEGETABLE RESIN. A concentrate of rubber latex made by adding to the latex, compounding ingredients, a stabilizing material, subsequently concentrating the mixture and adding ammonia to it.—Dunlop Rubber Co., Ltd., London, assignee of D. F. Twiss and E. A. Murphy, Birmingham, all in England.

288,463. TIRE. The employment of a mixture of a rubber-like product obtained by polymerizing butadiene and of a filling material.—I. G. Farbenindustrie A. G., Frankfort-on-Main, assignee of C. Krauch and M. Mueller-Cunradi, Ludwigshafen-on-Rhine, all in Germany.

288,484. ACCELERATOR. Rubber Service Laboratories Co., Akron, O., assignee of W. Scott, Nitro, W. Va., both in the U. S. A.

288,640. SUBSTITUTE. A composition including a filling material, a vulcanizing agent, and a product resulting from the treatment of vinyl acetate with an aldehyde.—Canadian Electro Products Co., Ltd., assignee of H. W. Matheson, both of Montreal, Can.

288,641. MOLDING COMPOSITION. A mixture including a filler, shellac, and a product resulting from the treatment of a vinyl ester with an aldehyde.—Canadian Electro Products Co., Ltd., assignee of H. W. Matheson, both of Montreal, Can.

288,661. LATEX PROCESSING. The method comprises adding a solution of a silicate to latex and treating the latex with sufficient reagent to form a hydrosol of silicic acid in the latex. The mixture is then allowed to stand until the whole assumes a true gel structure.—Dominion Rubber Co., Ltd., Montreal, Can., assignee of J. McGavack, Jackson Heights, L. I., N. Y., U. S. A.

288,662. DISPERSION PROCESS. Two or more ingredients are dispersed in a liquid which is a nonsolvent for rubber, but are capable of diffusing into rubber and contacting a rubber composition with the dispersion medium.—Dominion Rubber Co., Ltd., Montreal, Canada, assignee of W. A. Steinle, Detroit, Mich., U. S. A.

288,767. SPONGE RUBBER. The surface of a mass of rubber prepared for the formation of sponge rubber is subjected to the action of a super-accelerator at a temperature below that of the generation of gas within the rubber mass. This is followed by generating gas within and hot vulcanizing the mass.—R. J. Noar, Pendleton, Lancaster Co., England.

288,863. ANTIOXIDANT. A reaction product of an aromatic mercaptothiazole with an aldehyde aromatic amine condensation product.—Goodyear Tire & Rubber Co., assignee of L. B. Sebrell, both of Akron, O., U. S. A.

288,864. ACCELERATOR. A method of producing mercaptobenzothiazol that comprises associating aniline with sulphur and carbon bisulphide at a temperature between 150° C. and 300° C. and under a pressure between 100 and 700 pounds per square inch.—Goodyear Tire & Rubber Co., Akron, O., assignee of W. J. Kelly, Philadelphia, Pa., both in the U. S. A.

Rubber Patents, Trade Marks and Designs

United Kingdom

305,195.† ANTIOXIDANT. Aryl hydroxides and amines are caused to react in the absence of solvents to produce compounds which improve the aging qualities of rubber.—Goodyear Tire & Rubber Co., assignee of A. M. Clifford, both of Akron, O., U. S. A.

305,249. ELASTIC COMPOSITION. Plastic compositions containing glue gum, etc.—W. T. Galbraith and A. E. Mills, both of Godalming, Surrey.

305,490.† RUBBER PASTES. For mixing with fillers, vulcanizing agents, etc., rubber pastes are prepared from latex by treatment with water soluble cellulose ether by heating and subsequent processing.—I. G. Farbenindustrie A. G., Frankfort-on-Main, Germany.

305,572.† ANTIOXIDANT.—Goodyear Tire & Rubber Co., assignee of A. M. Clifford, both of Akron, O., U. S. A.

305,630.† RUBBER ELECTROLYSIS. — Siemens-Elektro-Osmose Ges., Siemensstadt, Berlin, Germany.

305,647.† ANTIOXIDANT. — Goodyear Tire & Rubber Co., assignee of A. M. Clifford, both of Akron, O., U. S. A.

305,745. UNITING RUBBER AND CELLULOSE. Mutual solvents for rubber and cellulose derivatives are used for bonding the materials together.—C. Macintosh & Co., Ltd., S. A. Brazier, and G. F. Thompson, all in Manchester.

305,802. ELECTRIC CABLES.—W. S. Taylor, Wallasey, Cheshire.

305,826. RECLAIMING PROCESS. Scrap rubber is treated at atmospheric pressure with a hot solution of a caustic alkali in one or more polyhydric alcohols.—Dunlop Rubber Co., Ltd., London, D. F. Twiss and F. Thomas, both of Birmingham.

305,968. CHLORINATING RUBBER.—F. C. Dyche-Teague, 258 Gloucester Terrace, London.

306,040.† CEMENT SEAL. The rubber particles of a latex are vulcanized while conserving its water suspension.—Dewey & Almy Chemical Co., assignee of B. Dewey, both of North Cambridge, Mass., U. S. A.

306,129.† POROUS COMPOSITION. This consists of permeable or impermeable fibrous, granular, or powdered substances and sulphur mixed with rubber latex in such proportions that the rubber content is about 15 per cent. A coagulating agent such as a salt is added to form a rubber gel which permeates the entire network. The mass is then molded and vulcanized.—H. Beckmann, Zehlendorf, Berlin, Germany.

306,225. COMPOUND SHEET. This is a base of paper, pasteboard, fabric, leather, or rubber covered on one or both sides with metal foil overlaid with cellulose hydrate foil.—L. Rado, Halensee, Berlin, Germany.

306,390.† RUBBER PRODUCT. Rubber is heated in the presence of an acid, the negative radicle of which consists of tin and a halogen. By heating a short period, a tough balata-like product is obtained, capable of being softened by heat and soluble in rubber solvents.—Goodyear Tire & Rubber Co., Akron, O., assignee of H. A. Bruson, 222 W. Washington Square, Philadelphia, Pa., both in the U. S. A.

†Not yet accepted.

General

United States

April 9, 1929*

1,708,050. TOOTHBRUSH. G. O. Burlew, Newark, N. J.

1,708,088. SHOE HEEL. J. R. Gammeter, Akron, O., assignor to The B. F. Goodrich Co., New York, N. Y.

1,708,127. FOOTWEAR TREAD MEMBER. W. W. Evans, New Rochelle, assignor to The B. F. Goodrich Co., New York, both in N. Y.

1,708,144. STOCKING PROTECTOR. F. H. Martin, Akron, O., assignor to The B. F. Goodrich Co., New York, N. Y.

1,708,219 and 1,708,220. SPRING SHACKLE. H. D. Geyer, assignor to The Inland Mfg. Co., both of Dayton, O.

1,708,221. SPRING COUPLING. H. D. Geyer, assignor to The Inland Mfg. Co., both of Dayton, O.

1,708,260. PLAYBALL. R. H. Coovert, assignor to The Pioneer Rubber Co., both of Willard, O.

1,708,339. CUSHION TIRE. R. Tannenbaum, Los Angeles, Calif.

1,708,637. TIRE INFLATER. D. H. Spicer, Lakewood, O.

1,708,668. TIRE FABRIC CONSTRUCTION. R. D. Evans, assignor to The Goodyear Tire & Rubber Co., both of Akron, O.

1,708,810. STOCKING PROTECTOR. R. Vrabek, New York, N. Y.

April 16, 1929*

1,709,049. ARCH PROTECTOR SHOE. G. J. Winter, Buffalo, N. Y.

1,709,124. TIRE CASING. J. I. Freeman and L. J. Peterson, both of Modesto, assignors of one-third to A. F. Peterson, Oakland, all in Calif.

1,709,207. FLEXIBLE CONNECTOR. J. R. Gammeter, Akron, O., assignor to The B. F. Goodrich Co., New York, N. Y.

1,709,383. SINK STRAINER. F. Wesbecher, assignor to himself and C. E. Hoefel, both of Akron, O.

1,709,483. AUTOMOBILE BUMPER. C. Offenhauser, Philadelphia, Pa.

1,709,493 and 1,709,494. PNEUMATIC BUMPERS. A. H. Shoemaker, Seattle, Wash.

Rubber Patents, Trade Marks and Designs

1,709,509. HORSESHOE. F. J. Wemett, Los Angeles, Calif.

1,709,544. DESK PAD. W. F. Sanders, Chicago, Ill.

1,709,635. ARCH SUPPORT. J. A. Skoglund, St. Paul, Minn.

1,709,677. VALVE-TUBE CAP. M. M. Metzinger, Blair, Nebr.

1,709,718. METAL-COVERED TIRE. N. Gherassimoff, Le Vesinet, assignor of one-half to E. Rivoche, Paris, both in France.

1,709,795. BAG FOR FURS. M. Krantz, London, England.

1,709,820. ABRASIVE WHEEL. J. R. Gammeter, assignor to The Geo. W. Perks Co., both of Akron, O.

April 23, 1929*

1,709,828 and 1,709,829. SPRING SHACKLE. R. H. Chilton, assignor to The Inland Mfg. Co., both of Dayton, O.

1,709,873. SWIMMING BELT. C. H. A. Petersen, Eugene, Oreg., assignor to New Life Preserver Co., a corporation of Oreg.

1,710,077. STOCKING PROTECTOR. W. M. Scholl, Chicago, Ill.

1,710,128. TIRE VALVE. C. H. Welch, Portland, Oreg.

1,710,160. RESPIRATOR. J. R. Gibbs, New York, N. Y., assignor to Gibbs Wahlert Mask Co., Inc., a corporation of N. Y.

1,710,174. AUTOMATIC CLUTCH. B. Mauvillier, Casablanca, Morocco.

1,710,378. COMPOSITE HEEL. W. A. Owen, Akron, O.

1,710,401. IRONING ROLL. B. W. Brockett, Cleveland Heights, assignor to The American Laundry Machinery Co., Norwood Station, Cincinnati, both in O.

1,710,459. RICE HUSKER AND FLOUR MILL. A. L. Romero, San Francisco, Calif.

1,710,619. DOORKNOB SHOCK ABSORBER. J. A. Haslinger, Tampashores, Fla.

April 30, 1929*

1,710,816. GOLF BALL CLEANER. H. Evans, Slough, England.

1,710,909. DRAFT ANIMALS' FOOTWEAR. A. Watson, St. Catharines, Ontario, Canada.

1,710,976. HEEL. R. P. Harshberger, Pasadena, Calif.

1,710,989. CLINGING FIGURE. A. Kelly, San Francisco, Calif.

1,711,192. ELECTROMAGNETIC REPRODUCER. J. B. Woodroffe, London, England.

1,711,255. RESILIENT CUSHION. E. A. Weinman and R. C. Beach, Seattle, Wash.

1,711,302. CUSHION HEEL. J. Belpedio, Bridgeport, Conn.

1,711,382. PNEUMATIC TIRE. I. Goldburg, Suffern, N. Y.

1,711,404. NONPNEUMATIC TIRE TUBE. M. Boyko, Cleveland, O.

1,711,422. CLOTHES WASHER. H. B. Mogk, Detroit, Mich.

*Under Rule No. 167 of the United States Patent Office, the issue closes weekly on Thursday, and the patents of that issue bear date as of the fourth Tuesday thereafter.

Dominion of Canada

April 2, 1929

288,403. CUSHION TIRE. M. Phillips, Los Angeles, Calif., U. S. A.

288,509. NON-SKID TIRE CHAIN. The Wire Cord Hose Pipe Co., Wilmington, Del., assignee of D. M. Weigel, Akron, O., both in the U. S. A.

April 9, 1929

288,570. BELT AND NAPKIN SHIELD. J. Josias, New York, N. Y., U. S. A.

288,585. PNEUMATIC TIRE VALVE. R. Maxwell, Chicago, Ill., U. S. A.

288,725. ELECTRIC HAIR BRUSH. J. Corfield, Merton Abbey, Co. of London, assignee of R. A. Shortland, Manchester, Co. of Lancaster, both in England.

April 16, 1929

288,804. CARPET SWEEPER MECHANISM. The Bissell Carpet Sweeper Co., Grand Rapids, Mich., assignee of I. J. Owen, Chicago, Ill., both in the U. S. A.

288,846. TIRE TREAD STRUCTURE. The Dunlop Rubber Co., Ltd., London, N. W. 1, assignee of F. Fellowes and F. A. Nicholas, Birmingham, all in England.

288,870. DUPLEX HOSE. The O. F. Jordan Co., assignee of H. W. Protzeller, both of East Chicago, Ind., U. S. A.

April 23, 1929

288,947. FOUNTAIN PEN. N. T. Burke, Stoneham, Mass., U. S. A.

288,952. GLASS RUN CHANNEL. H. W. Fauver, Detroit, Mich., U. S. A.

288,967. BATHING CAP. G. P. Kaul, Detroit, Mich., U. S. A.

288,992. TIRE PRESSURE GAGE. N. T. Shorts, Fern, Pa., U. S. A.

288,998. FACE LIFTER. D. N. Trickey, Seattle, Wash., U. S. A.

289,089. HOT WATER BOTTLE STOPPER. The Seiberling Rubber Co. of Canada, Ltd., assignee of W. W. Sanders, both of Toronto, Ontario.

United Kingdom

March 27, 1929

304,899. PARACHUTE. S. X. Pantsos, (known as Pantcheff), 16 Victoria Rd., Buckhurst Hill, Essex.

304,903. HOT WATER BOTTLE STOPPER. Campbell, Achnach & Co., Ltd. and D. C. Campbell, 59 Wallace St., Glasgow.

304,946. LONG-ARM. R. Ladrier, 131 Rue Alfred Georges, Lodelinsart, Belgium.

304,957. CONTROLLING TIRE INFLATION. T. H. Clift, 3 Rowcroft, Stround, Gloucestershire.

304,988. TOP BOOT. E. A. Nickerson, 182 Maplewood St., Watertown, Mass., U. S. A.

304,993. RIVET-CAULKING MACHINE. Babcock & Wilcox, Ltd., Babcock House, Farringdon St., London.—(Babcock & Wilcox Co., 85 Liberty St., New York, N. Y., U. S. A.)

304,999. SHIRT CUFFS. J. H. Anderson, 473 North Cleveland Ave., St. Paul, Minn., U. S. A.

305,024.† POWDER DISTRIBUTOR. P. Baquey, (known as G. Baquey), 5 Rue Clara Lemoine, Colombes, Seine, France.

305,031†. GRAMOPHONE PICK-UP. Loewe-Radio Ges., 10 Wiesenweg, Steglitz, Berlin.

305,058. ACOUSTIC INSTRUMENT. A. A. Linsell, 47 Crown St., Brentwood, Essex.

305,085. ELECTRIC CABLE. W. E. Beatty, Bush House, Aldwych, London.—(Bell Telephone Laboratories, Inc., 463 West St., New York, N. Y., U. S. A.)

305,104†. DEVELOPING PHOTOGRAPHIC DIAZOTYPE. M. Renker, 19 Friedrichstrasse, Düren, Rhineland, Germany.

305,122†. PAPER TREATING. I. G. Farbenindustrie Akt.-Ges., Frankfort-on-Main, Germany.

305,124†. TIRE. A. Ritchie, Mill Rd., Waimate, Canterbury, N. Z.

305,142†. WATER RAISING APPARATUS. R. H. S. Wade, Cowichan Station, British Columbia, Canada.

305,144†. GRAMOPHONE. E. Foretay, Le Feu Follet, Ave. de Cour, Lausanne, Switzerland.

305,159. WATER BOTTLE STOPPER. G. H. C. Lumsden, The Frayles, Langhurst Hill, near Petworth, Sussex.

305,184†. VALVE. A. Winterhoff, 9 Adalbertstrasse, Düsseldorf, Germany.

305,196†. TIRE REPAIRING. Goodyear Tire & Rubber Co., 1144 E. Market St., assignee of B. C. Eberhard, 62 Dodge Ave., both of Akron, O., U. S. A.

305,216†. PRINTING MACHINE. J. Enschede En Zonen, Haarlem, Holland.

305,272. DOUBLE GLAZED WINDOW. Frigidaire, Ltd., Chapter St. House, Vauxhall Bridge Rd., London, R. J. Mitchell, The Homestead, Huntercombe Manor Estate, Taplow, Buckinghamshire, and A. T. Hawkins, 16 Selvage Lane, Mill Hill, London.

305,296. ELECTRIC COUPLING. British Thomson-Houston Co., Ltd., Crown House, Aldwych, London, C. J. Morton, Amulree, St. Paul's Rd., Coventry, and T. H. Woodfield, 85 Addison Rd., King's Heath, Birmingham.

305,316. HORSESHOE. E. P. Randell, The Forge, Preston-on-Wye, Herefordshire.

April 4, 1929

305,391. PORTABLE HOOK. N. Richendoller, 30 Mildmay Rd., Islington, London.

† Not yet accepted.

305,404. COMPOUND TRANSPARENCY. J. A. Watt, 72 Linton Apts., Sherbrooke St. West, Montreal, Canada.

305,417. CATAMENIAL APPLIANCE. E. Spardel, 122 Hasselbrook Strasse, Hamburg, Germany.

305,461†. PIPE JOINT. Soc. Metallurgique Du Perigord, 43 Rue de Clichy, Paris.

305,504. GOLF BALL. Dunlop Rubber Co., Ltd., and A. W. T. Hyde, Fort Dunlop, Birmingham.

305,533†. VEHICLE WHEEL. Michelin Et Cie, Clermont-Ferrand, Puy-de-Dome, France.

April 10, 1929

305,739. EGG PACKING. E. R. Jones, Jesmondene, Broadlands Ave., Shepperton, Middlesex.

305,819. GRAMOPHONE. H. J. Cullum, V. H. Ashton and H. Tye, 76 City Rd., London.

305,823. PRESSURE GAGE. V. A. Trier, Andre Works, Victoria Gardens, Notting Hill Gate, London.

305,825. MUD GUARD. J. E. Blincow, Glencote, Woodfield Ave., Penn, Wolverhampton.

305,878. FEEDING BOTTLE. W. May, 30 Rectory Rd., Manor Park, London.

305,890. WEARING APPAREL MEASURER. A. Joeckel, 114 Kaiser Friedrichstrasse, Cottbus, Germany.

305,901. DYEING APPARATUS. C. S. Bedford, Adel Manor, Adel, Leeds.

305,911. PNEUMATIC CUSHION. G. W. T. Leeson, Sorbo Works, Woking, Surrey.

305,921. ROAD VEHICLE. Henschel & Sohn Ges., Kassel, Germany.

305,982†. PIANO PEDAL PROTECTOR. A. and A. Dölling, (trading as A. & M. Dölling,) Siebenbrunn, Voigtland, Germany.

April 17, 1929

306,126†. KINEMATOGRAPH PROJECTOR. K. Morsbach, Lichterfelde-West, Berlin.

306,167. STOPPER. Turley & Williams (1925), Ltd. and W. H. Morris, 2 Green St., Birmingham.

306,187. VALVE. T. A. Clapham and A. B. Auty, Wellington Foundry, Keighley.

306,189. DIAPHRAGM. Gramophone Co., Ltd., Hayes, A. Whitaker, Colne Mead, West Drayton, both in Middlesex, A. M. Hallawell, Little Gables, Wallington, Surrey, and G. H. Buckle, Brackenwood, Iver Heath, Buckinghamshire.

306,214. VEHICLE BODY. W. Lyons, of Swallow Sidecar & Coachbuilding Co., Cocker St., Blackpool.

306,254. MASSAGE APPLIANCE. E. Gersabeck, 9 Erfurterstrasse, Schöneberg, Berlin.

306,260. EXCAVATOR. W. Q. Henriques, 1 St. Andrew's Rd., Claughton, Birkenhead.

306,330. HOT WATER BOTTLE. Leyland & Birmingham Rubber Co., Ltd., 24 Duke St., Aldgate, London, and R. W. Lunn, 53 West Cliff, Preston, Lancashire.

306,375. TURNING WOODEN RODS. H. Sielemann, Winkelstrasse, Bünde, Westphalia, Germany.

306,481†. AEROPLANE WHEEL. Goodyear Tire & Rubber Co., 1144 East Market St., assignee of C. H. Roth, 267 Shawnee Path, both of Akron, O., U. S. A.

†Not yet accepted.

Rubber Patents, Trade Marks and Designs

Germany

474,841. SLIPON SOLE. John Lucian Grigsby Dykes and Samuel Rambo Pruyn, Chicago, Ill., U. S. A. Represented by W. Stern, Essen.

475,315. SUCTION HOLDER. Kremp & Huttemeister, Ludenscheid i. W.

475,405. ADVERTISING FIGURE. Georg Krauss, Rodach b. Koburg.

Designs

1,066,727. RUBBER AND LEAD CABLE. Robert Baumgart, Glienickerstrasse 18, Berlin-Kopenick.

1,066,820. SHOE. Maurice Wissaert, Brussels. Represented by H. Heimann, Berlin, S. W. 61.

1,067,086. BLOOD PRESSURE DEVICE. Richard Kallmeyer & Co., Johannisstrasse 20-21, Berlin N. 24.

1,067,233. BALL. Rheinische Gummi-und Celluloid Fabrik, Mannheim, Neckarau.

1,067,434. TRAFFIC REGULATING STRIP. Rudolf Sauberlich, Sybelstrasse 24, Berlin-Charlottenburg.

1,067,985. EAR PROTECTOR. Firma Ernst Knott, Strickwarenfabrik, Taura b. Burgstadt.

1,068,001. RUBBER-COVERED METAL SPRING. Allgemeine Elektricitats-Gesellschaft, Friederich Karl Ufer, 2-4, Berlin N. W. 40.

1,068,002. SQUIRT STOPPER. Erste Bamberger Metallkapsel und Metallwarenfabrik. Kaufmann & Sohn, Bamberg i. Bay.

1,068,015. CLEANING BRUSH FITTINGS. Friederich Kressmann, Blumenthalstrasse 37, Berlin O. 112.

1,068,088. INSTRUMENT CAP. Georg Wolf, G. m. b. H., Karlstrasse 18, Berlin N. W. 6.

1,068,255. ANTIOZONE, CONDUCTION. Rheinische Draht-und Kabelwerke, G. m. b. H., Koln-Riehl.

1,068,745. COLLAPSIBLE BOAT. Harburger Gummiwarenfabrik Phoenix A. G., Harburg-Wilhelmsburg.

1,068,858. POLISHING MACHINE JOINT. Reinhold Wolf, Freiberg i. S.

1,068,918 and 1,068,919. RAINCOAT. Continental Caoutchouc-und Gutta-Percha Compagnie, Hannover.

1,069,502. ENDLESS BELT. Berlin-Rixdorfer Gummiwarenfabrik. Hans Schumann, Mullerstrasse 171a-172, Berlin, 39 N.

1,069,935. HORSE SHOE PAD. Karl Trept, Gross-Schonau i. S.

1,070,019. APRON. Firma M. Steinberg, Koln-Braunsfeld.

1,070,066. ANTI-SKID DEVICE FOR TIRES. Valentin Bronner, Magstadt, Wurtt.

Trade Marks

United States

Two Kinds of Trade Marks Now Being Registered

Under the rules of the United States Patent Office, trade marks registered under the Act of February 20, 1905, are, in general, fanciful and arbitrary marks, while those registered under the Act of March 19, 1920, Section (1) (b) are non-technical, that is, marks consisting of descriptive or geographical matter or mere surnames. To be registered under the later act, trade marks must have been used for not less than one year. Marks registered under this act are being published for the first time when registered, any opposition taking the form of an application for cancellation.

April 9, 1929

Act of February 20, 1905

255,016. DRI-TOT—rubber baby pants. The Seamless Rubber Co., Inc., New Haven, Conn.

April 16, 1929

Act of February 20, 1905

255,075. SQUEEGEE — pneumatic vehicle tires. The B. F. Goodrich Co., New York, N. Y.

255,082. Circle across the center of which is a rectangle, both having dark backgrounds and light borders, and in the rectangle appears the word: "KARG"—pneumatic tires and tubes. Karg Tire & Rubber Co., Chicago, Ill.

255,159. Representation of a shield containing the letter: "M", and below the representation the word: "MARATHON"—soles and heels of shoes wholly or partly of rubber. The Goodyear Tire & Rubber Co., Akron, O.

255,161. Representation of a bull dog and the words: "BULL DOG"—combs. Hanover Rubber Co. "Excelsior" Inc., New York, N. Y.

255,168. Representation of an arch containing the words: "ARCH TREAT"—shoes of a combination of leather, rubber, and fabric. Senack Shoe Co., St. Louis, Mo.

255,169. Representation of an arch containing the words: "ARCH BALM"—shoes of a combination of leather, rubber, and fabric. Senack Shoe Co., St. Louis, Mo.

255,175. Circle containing the word: "SULTAN"—shoe soles. Alfred Hale Rubber Co., Atlantic, Mass.

255,193. CARNATION—pencils and rubber erasers. Joseph Dixon Crucible Co., Jersey City, N. J.

255,209. Circle with a dark background and light border containing the words: "ROBYN HEALTH-MODE SHOES" and the representation of a robin perched on a streamer containing the words: "SAFEGUARD FOOT COMFORT"—women's shoes of leather, rubber, and fabric, and combinations of these materials. Robinson-Bynon Shoe Co., Auburn, N. Y.

Rubber Patents, Trade Marks and Designs

255,212. Representation of a lined shield containing a circle in which appear the words: "STANDARD QUALITY"—rubber shoe soles. P. & B. Rubber Co., Inc., Laurel Hill, N. Y.

April 23, 1929

Act of February 20, 1905

255,345. Circle containing two eagles, and the words: "DOUBLE EAGLE"—pneumatic tires and parts of such tires, etc. The Goodyear Tire & Rubber Co., Akron, O.

255,362. PREMOID — rubber-containing fibrous material in block or sheet form, including rubber-containing paper rolls. Premoid Products, Inc., West Springfield, Mass.

255,364. PARABUCK — rubberized fabrics. Haartz-Mason Rubber Mfg. Co., Watertown, Mass.

255,461. VIM—portable rubber tire and tube patching kits. The R. M. Hollingshead Co., Camden, N. J.

255,571. WINTERIZED—tires. Dunlop Tire & Rubber Corp., Buffalo, N. Y.

255,586. SPRAYTEX—adhesive tape for use by painters. The Seamless Rubber Co., New Haven, Conn.

Act of March 19, 1920

255,602. ANTIBES—shoes of leather, rubber, fabric, and/or combinations thereof; also other garments for men, women, and children. Best & Co., Inc., New York, N. Y.

255,609. NO-PUMP—flexible valved tubular members for delivering fluid pressure to pneumatic tires. No-Pump Mfg. Co., Los Angeles, Calif.

255,621. Rectangle containing the words: "TRAVERS SHOE STORES" — shoes of leather, rubber, fabric, or combinations of these materials. J. Pozitzer, doing business as Travers Shoe Stores and Potters Shoe Stores, Louisville, Ky.

April 30, 1929

Act of February 5, 1905

255,629. REDSKEN—inner tubes for tires, patches for such inner tubes, and rubber or rubberized-fabric hose. Redsken Mfg. Co., Houston, Tex.

255,631. SENTRY—pneumatic vehicle tires. The B. F. Goodrich Co., New York, N. Y.

255,651. TYRSPOTTER — tire-vulcanizing machines. The Akron Tyrwelder Co., Akron, O.

255,728. AURORA — bias binding. I. B. Kleinert Rubber Co., New York, N. Y.

255,738. WHOOPEE—footwear of leather, rubber, and textiles. Harry Hess, New York, N. Y.

255,767. Diamond containing the words: "SYNCRO SHOES — SYNCHRONIZED — TUNED TO THE FOOT"—boots and shoes of leather, rubber, fabric, or reenforced with steel, aluminum, or other metal parts, or of combinations of those materials. Charles M. Huette, St. Louis, Mo.

255,855. Representation of an arrow through the words: "IKE WALTON," and below the representation the words: "SPORTING BOOT"—rubber boots and shoes, rubber overshoes, rubber-soled canvas shoes. Hood Rubber Co., Watertown, Mass.

255,865. Representation of a winged dragon holding in one fore-paw a monogrammed shield on a shelf across which is a streamer containing the words: "SEMPER SURSUM" — dental rubber syringes or parts thereof. Dr. Heinr. Traun & Söhne, vormals Harburger Gummi-Kamm-Compagnie, Hamburg, Germany.

255,875. NUVO—sanitary belts. The I. B. Kleinert Rubber Co., New York, N. Y.

255,912. Representation of a double arrow containing two arrow heads and the word: "AERO"—pneumatic and cushion tires and tubes. Hood Rubber Co., Watertown, Mass.

Dominion of Canada

April 2, 1929

45,802. Word: "SOLIDHED," drawn in a circular manner around the representation of a negro's head—erasers, rubber bands, etc. The Solidhed Co., Hoboken, N. J., U. S. A.

45,841. Word: "DETERGO"—cleaning preparation for all kinds of floors, linoleums, rubber floors, etc. Continental Chemical Corp. of Ill., Watseka, Ill., U. S. A.

45,853. Word: "FIT," written in a circle placed in the center of a device formed by two superimposed ellipses, the great axes of which are at right angles —machines and apparatus for renovating or retreading and repairing pneumatic tires, and of pneumatic tires, covers for pnuematic tires and air tubes for pneumatic tires, all new or repaired, and all articles and goods manufactured from india rubber. Societé des Procedes Fit, Grenoble, Isère, France.

April 16, 1929

45,920. Word: "EVERBRIGHT"—pyroxylin-coated and rubber-coated fabrics. Canadian Fabrikoid, Ltd., Montreal, Que.

45,945. Words: "BABY BATHINETTE"—infants' folding bathtubs and combination bath cabinets and tubs made wholly of wood and rubber cloth. E. M. Trimble Mfg. Co., Inc., Rochester, N. Y., U. S. A.

United Kingdom

April 3, 1929

488,986. Circle in which appears a representation of a baseball containing the words: "SPALDING — TRADE MARK" — boots and shoes, galoshes, waterproof clothing, etc. A. G. Spalding & Bros. (British), Ltd., 317-318 High Holborn, London, W. C. 1.

497,902. Triangle containing a representation of an outline of a hand and the words: "HANDY THINGS"—goods manufactured from india rubber and gutta percha not included in other classes. Handy Things, Ltd., 11 Spencer St., Westminster, London, S. W. 1.

April 10, 1929

139,728. ARCANA—cushion and mattress covers composed of cotton impregnated with india rubber. J. Jackson & Co., 7 Suffolk St., Birmingham.

491,658. BATES — india rubber thread. Dunlop Rubber Co., Ltd., Ft. Dunlop, Holly Lane, Erdington, Birmingham.

April 17, 1929

498,655. Representation of the outline of the British Isle containing the words: "'POUK' BRAND"—machine belting and conveyer bands of india rubber. Lewis & Tylor, Ltd., Gripoly Mills, Sloper Road, Cardiff.

499,295. VULCAN—india rubber solutions and compounds composed principally of india rubber for making or repairing motor or cycle inner tubes and tires. Vulcan Products, Ltd., Calders Row, Brixton Hill, London, S. W. 2.

April 24, 1929

139,755. VELDEX—piece goods of cotton duck, velveteen, and india rubber, the cotton predominating. A. P. Quick, Ltd., 10 Lovells Court, Paternoster Row, London, E. C. 4.

489,821. VULCATEX—machine transmission belting of india rubber. W. Jesseman & Co., Ltd., 20-21 Watchhouse Parade, Alexandra Docks, Newport, Monmouthshire.

494,396. WARWICK—golf balls. Dunlop Rubber Co., Ltd., Fort Dunlop, Holly Lane, Erdington, Birmingham.

499,172. DORCO—articles of clothing made of india rubber, but not including boots or shoes, and not including any goods of a like kind to boots or shoes. Dr. Dorogpes Tarsa Gummigyar Reszvenytarsasag, 50 Albertfalva, Budapest, Hungary, (c/o H. Gardner & Son, 173-175 Fleet St., London, E. C. 4).

499,227. SEAGULL—inflatable boats and inflatable rafts and life buoys. Gustav Winkler, Kopenickerstrasse 32a, Berlin, S. O. 16, Germany, (c/o J. E. Evans-Jackson & Co., 57-60 Holborn Viaduct, London, E. C. 1).

Designs

United States

78,191. SHOE SOLE. Term 14 years. Paul L. Bush, assignor to Mishawaka Rubber & Woolen Mfg. Co., both of Mishawaka, Ind.

78,245. TIRE. Term 3½ years. Ernst A. Wullenweber, Melrose, assignor to Hood Rubber Co., Watertown, both in Mass.

78,311. GOLF BALL. Term 14 years. W. J. Perry, assignor to The India Rubber Gutta Percha & Telegraph Works Co., Ltd., both of London, England.

78,393. TIRE. Term 14 years. Ralph W. Hutchens, assignor to Gillette Rubber Co., both of Eau Claire, Wis.

Prints

United States

11,700. GOOD — WINGFOOT — YEAR TIRES. Tires wholly or partly of rubber. The Goodyear Tire & Rubber Co., Akron, O. Published Jan. 28, 1929.

MARKET REVIEWS

CRUDE RUBBER

New York Exchange

MAY 1. London prices were practically unchanged from yesterday and very dull. Trading was quite active with fair inquiry. Prices closed up 20 points on May, June, July, and September, 30 points on December, and 10 points on March. It was understood that factory interest caused this firmness. Closing prices: May, 19.70-80; July, 20.50; Sept., 20.70; Dec., 21.10.

MAY 2. Opening prices and sales were 10 points higher than yesterday's close. London cables were steady, and there was little inclination to trade during the day. Towards the close, with nothing to steady London cables and little factory interest, rubber was offered in fairly large quantities with no active buyers. Prices then sold off 20 points from the previous day and closed off about 30 to 40 points in all positions except May which was fairly steady because of a fair demand for nearby rubber. Closing prices: May, 19.40; July, 20.10; Sept., 20.40; Dec., 20.70.

MAY 3. London prices opened around the previous close but finally advanced ⅛ pence and closed firm. New York opened steady with prices 20 points up from the previous close and on short covering and good trade buying advanced 50 to 60 points in practically every position. At the close prices eased off because of a little profit taking. Closing prices: May, 19.70; July, 20.20; Sept., 20.60; Dec., 20.80.

MAY 4. Prices advanced 20 to 30 points on all positions because of covering by shorts and those who had sold early in the week taking in their supply rather than waiting over the week-end, giving the market a rather firm undertone. Trading was limited but steady. Closing prices: May, 19.90; July, 20.50; Sept., 20.80; Dec., 21.20.

MAY 6. With London ¼ pence higher and steady but finally easing off ⅛ pence, prices advanced about 30 points over the previous close. Due to lack of support on the advance and no factory demand, the prices eased off about 10 points, closing fairly steady. Closing prices: May, 20.10; July, 20.60; Sept., 20.90; Dec., 21.30.

MAY 7. London prices were up ¼ pence and at one time ⅜ pence in all positions although closing at a final advance of ¼ pence. Urgent short covering and active trading advanced prices 70 to 90 points in every position and most positions closed on the high with one or two others 10 points under. This buying was also caused by very few offers from London and the Far East which gave added strength to the market. Closing prices: May, 20.70; July, 21.20; Sept., 21.60; Dec., 21.90.

MAY 8. London prices were up ⅛ pence and at one time were up a full pence although easing ⅛ pence at the close. Prices advanced in every position about 50 to 60 points. Active trading and short covering maintained prices at this level until the close when a little profit taking was in evidence, but such offers were picked up at 10 points below the high. The market closed active and firm. Closing prices: May, 21.20; July, 21.70; Sept., 22.10; Dec., 22.50.

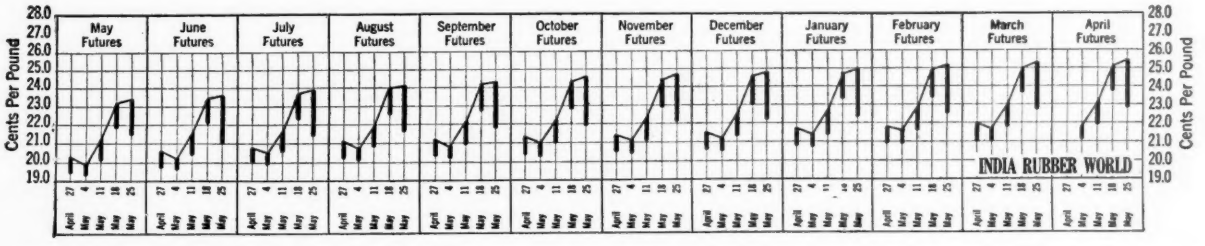
MAY 9. London opened up ⅛ pence on all positions and fluctuated in a narrow range all day, finally closing on the previous day's close. Trading on the Rubber Exchange was dull with the final prices off about 20 to 30 points from the previous close. Closing prices: May, 21.00; July, 21.50; Sept., 21.90; Dec., 22.20.

MAY 10. London opened ⅛ pence easier and trading on the Rubber Exchange was light, prices fluctuating in narrow range from 10 to 20 points, closing 10 points lower on July-Sept. and 30 points lower on Oct.-Dec. There was no market trend, buyers and sellers being about evenly divided. Closing prices: May, 20.80; July, 21.40; Sept., 21.80; Dec., 21.90.

MAY 11. Prices were up 20 to 30 points due to short covering of those who did not care to wait over the week-end, giving the market a firm undertone. Closing prices: May, 21.10; July, 21.60; Sept., 22.00; Dec., 22.10.

MAY 13. London opened ⅜ pence up from Saturday's close and advanced another ¼ pence but finally closed at 1/16 pence off from the day's high. Trading on the Rubber Exchange opened carefully but with higher London cables, urgent short covering and good trade buying on

New York Rubber Exchange—High and Low Monthly Futures



The Rubber Exchange of New York, Inc.

DAILY MARKET FUTURES—RIBBED SMOKED SHEETS—CLOSING PRICES—CENTS PER POUND—"A" CONTRACTS

Positions 1929	April, 1929					May, 1929																			
	25	26	27	29	30	1	2	3	4	6	7	8	9	10	11	13	14	15	16	17	18	20	21	22	23	24	25
May	19.4	19.6	19.6	19.3	19.5	19.7	19.4	19.7	19.9	20.1	20.7	21.2	20.9	20.8	21.2	21.8	22.4	22.0	22.0	22.7	23.2	23.4	22.4	22.2	21.5	....	....
June	19.7	20.0	19.9	19.6	19.9	20.0	19.7	19.9	20.2	20.4	21.0	21.5	21.1	21.1	21.3	22.1	22.6	22.1	22.2	22.9	23.4	23.6	22.6	22.5	21.6	21.0	21.5
July	20.0	20.3	20.2	19.9	20.2	20.3	19.9	20.2	20.5	20.6	21.2	21.7	21.5	21.3	21.4	22.3	22.8	22.5	22.5	23.2	23.7	23.9	23.1	22.7	22.0	21.4	21.9
August	20.2	20.5	20.3	20.1	20.3	20.5	20.1	20.3	20.7	20.8	21.4	21.9	21.6	21.5	21.6	22.5	23.0	22.7	22.8	23.5	24.0	24.1	23.3	23.0	22.2	21.6	22.3
September	20.3	20.6	20.4	20.2	20.4	20.6	20.2	20.6	20.8	20.9	21.6	22.1	21.8	21.6	21.8	22.7	23.2	22.8	23.0	23.6	24.2	24.3	23.5	23.2	22.4	21.8	22.5
October	20.4	20.7	20.6	20.4	20.5	20.7	20.3	20.7	21.0	21.0	21.7	22.2	22.0	21.7	21.9	22.8	23.4	22.9	23.1	23.8	24.3	24.6	23.6	23.3	22.6	21.9	22.6
November	20.5	20.8	20.8	20.5	20.6	20.8	20.4	20.8	21.1	21.1	21.8	22.3	22.1	21.8	22.0	22.9	23.5	23.1	23.2	24.0	24.4	24.7	23.8	23.5	22.8	22.1	22.7
December	20.6	20.9	20.9	20.6	20.8	20.9	20.5	20.8	21.2	21.3	21.9	22.5	22.2	21.9	22.1	23.0	23.6	23.2	23.4	24.2	24.6	24.8	23.9	23.6	22.9	22.2	22.8
1930																											
January	20.8	21.0	21.1	20.7	21.0	21.1	20.7	20.9	21.4	21.4	22.1	22.7	22.4	22.1	22.3	23.3	23.9	23.3	23.4	24.3	24.7	25.0	24.0	23.7	23.0	22.3	22.9
February	20.9	21.2	21.2	20.9	21.2	21.3	20.9	21.1	21.6	21.6	22.3	22.8	22.5	22.2	22.4	23.4	24.0	23.4	23.6	24.5	24.9	25.1	24.2	23.9	23.2	22.5	23.1
March	21.0	21.3	21.3	21.1	21.3	21.4	21.0	21.2	21.7	21.8	22.4	23.0	22.7	22.4	22.6	23.6	24.1	23.6	23.8	24.6	25.0	25.3	24.3	24.0	23.4	22.7	23.3
April	....	....	....	....	....	21.5	21.1	21.3	21.8	21.9	22.5	23.1	22.8	22.5	22.7	23.7	24.2	23.7	23.9	24.7	25.1	25.4	24.4	24.2	23.5	22.8	23.4

the expected high consumption estimates, prices quickly advanced, and closed with very active trading, 90 to 100 points higher on the various positions. Closing prices: May, 21.80; July, 22.30; Sept., 22.70; Dec., 23.00.

MAY 14. With London opening up ¼ pence higher on nearbys and ⅛ pence higher on futures, and then advancing another ¼ pence, the opening prices on the Exchange were 30 points higher, the advance continuing so that some positions showed an increase of 60 to 70 points. There was urgent short covering and trade buying with few shipment offers in the market. Trading was heavy, 1,288 lots changing hands. Closing prices: May, 22.40; July, 22.80; Sept., 23.20; Dec., 23.60.

MAY 15. With London ⅛ pence higher on practically every position and advancing another ⅛ pence, prices opened strong early and continued with active buying and urgent short covering from 60 to 80 points above the previous close. Large quantities being sold, prices receded to 10 points below yesterday's close; the market was excited, and prices fluctuated 20 to 30 points between sales. Trading was heavy, 2,101 lots having changed hands. The market closed in some positions 40 to 60 points under the previous close. Closing prices: May, 22.00; July, 22.50; Sept., 22.80; Dec., 23.20.

MAY 16. Trading was quieter today owing to the lower prices in the London market, and eased off 20 to 30 points from the previous day; but on slightly steadier London cables and shorts covering, prices closed rather steady. Closing prices: May, 22.00; July, 22.50; Sept. 23.00; Dec. 23.40.

MAY 17. London cables were ¼ pence higher and finally ⅜ pence higher in all positions, and also because of the approaching holiday in London and Singapore on Saturday, active buying developed together with short covering, with the result that prices advanced 70 to 80 points on May, July, September, and December, the most active months. Closing prices: May, 22.70; July, 23.20; Sept., 23.60; Dec., 24.20.

MAY 18. A holiday in London today and Monday and with continued reports of heavy consumption, prices advanced from 50 to 60 points in practically all positions. With heavy buying and shorts covering the market closed firm. Closing prices: May, 23.20; July, 23.70; Sept., 24.20; Dec., 24.60.

MAY 20. With London and Singapore closed and no prices and offers from these markets, trading was quiet although prices showed an advance of about 20 to 30 points in most positions. Closing prices: May, 23.40; July, 23.40; Sept., 24.30; Dec., 24.80.

MAY 21. The opening in London and Singapore after a two-day holiday was disappointing since prices were on the parity with New York. Opening prices on the Exchange were lower, and on professional selling and commission-house liquidation the market eased off about 80 to 100 points in the various positions, with trading dull on the decline. Closing prices: May, 22.40; July, 23.10; Sept. 23.50; Dec., 23.90.

MAY 22. Opening prices were lower and declined to a low of 70 points from the previous close, but on fair buying and short covering, advances of 50 points were made in practically every position. Prices closed 10 points from the high of the day and about 30 to 40 points lower than the previous close. C I F offers were high and scarce, and traders were not inclined to force the market on the bear side. Closing prices: May, 22.20; July, 22.70; Sept., 23.20; Dec., 23.60.

MAY 23. Prices opened steady at about the previous close, then sagged off about 40 points, came back 20 points, and finally closed about 70 points lower on practically every position. Closing prices: May, 21.50; July, 22.00; Sept., 22.40; Dec., 22.90.

MAY 24. With London steady and practically ⅛ pence higher than the previous close, the New York market opened up 30 to 40 points on practically every position. Buyers lacking, the market sold off around midday and continued selling especially at the close, forcing prices down to a total loss of 90 points for the day. There was no special reason for the selling with London firm except that there was no factory demand. The undertone was distinctly heavy and losses during the last week amounted to slightly less than 3 cents per pound. Actual conditions of the market have not changed to any degree, not to the extent to warrant the drastic set-back, and it is this factor that has tended to disturb confidence. Closing prices: July, 21.40; Sept., 21.80; Dec., 22.20.

MAY 25. Much to the surprise of traders on the Rubber Exchange, prices opened higher in London with the result that very few sales were made at the opening call although bids were higher. Finally a little buying developed, and prices were 50 to 60 points higher than Friday's close. Trading was nervous and uncertain. Closing prices: July, 21.90; Sept., 22.50; Dec., 22.80.

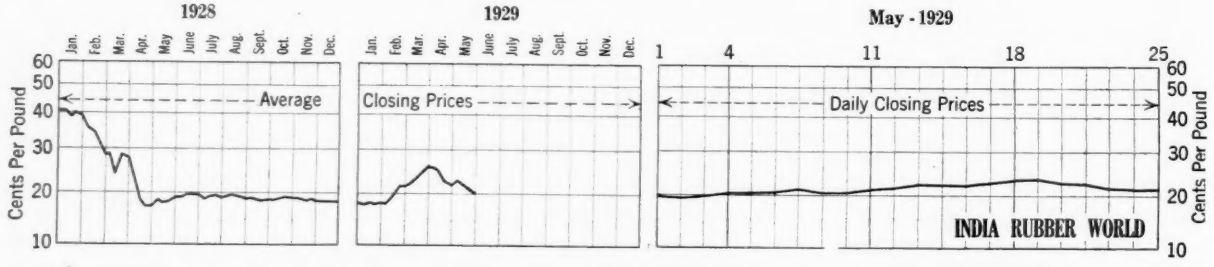
New York Outside Market

APRIL 30. Offerings were scarce from the Far East and although little factory business was in evidence except at low prices, dealers were disinclined to sell. Prices steadied and together with the strength of the Exchange, quotations were raised about ¼ to ⅜ of a cent with little business passing.

Spot	Today	Month Ago	Year Ago
First Latex	20½	23¾	17⅝
Ribs	19¾	23	17⅜
Up River Fine....	22	23¾	17½

MAY 1. Factories were in the market for nearby, June, and July rubber and picked up fair quantities at slightly higher prices than yesterday. First latex crepe

New York Outside Market—Spot Closing Prices Ribbed Smoked Sheets



New York Outside Market—Spot Closing Rubber Prices—Cents Per Pound

PLANTATIONS	April, 1929								May, 1929														
	22	23	24	25	26	27	29	30	1	2	3	4	6	7	8	9	10	11	13	14	15	16	17	18
Sheet																								
Ribbed smoked	19¾	20⅜	19¾	19⅝	19¾	19¾	19½	19⅝	19⅞	19½	19⅞	20⅝	20¾	20¾	21⅜	20⅞	20⅞	21⅛	21⅞	22¾	22¼	22⅛	22⅞	23½
Crepe																								
First latex	20⅛	20¾	20⅛	20⅛	20¼	20¼	20	20¼	20¾	20⅛	20¼	20⅝	20¾	21¼	21¾	21⅜	21⅜	21⅝	22½	23	22¾	22¾	23½	24⅛
"B" blanket	18¼	18½	18¼	18	18⅛	18⅛	18	18¼	18¼	18⅛	18¼	18½	18¾	19⅛	19⅝	19⅜	19½	19½	20⅛	20⅝	20½	20⅜	21	21½
"C" blanket	18	18¼	17⅞	17¾	17⅞	17⅞	17¾	18	18	17¼	17⅞	18⅛	18½	18⅞	19¾	19¼	19	19¼	19⅞	20⅜	20¼	20⅛	20¾	21¼
"D" blanket	17½	17¾	17½	17⅛	17¼	17½	17¾	17½	17½	17⅜	17½	17¾	18	18⅜	18⅞	18⅝	18½	18¾	19⅜	19⅞	19¾	19¾	20¼	20¾
No. 2 brown.....	17⅞	18½	17⅞	17¾	17⅞	17⅞	17¾	17⅞	17⅞	17¾	17⅞	18⅛	18½	18⅞	19¾	19⅛	19	19¼	19⅞	20⅜	20¼	20⅛	20¾	21¼
Rolled brown	13⅝	13¾	13½	13½	13	13	12⅞	13	13¼	12¾	13⅛	13½	13⅝	14	14⅜	14⅜	14½	14¾	15⅜	15⅞	15¾	15¾	16¼	16¾
Off latex	19⅞	20½	19⅞	19⅞	19⅞	19⅞	19⅝	19⅞	19⅞	19¾	20	20¼	20½	21	21½	21	21	21¼	22¼	22⅝	22¼	22¼	23	23⅝

is scarce and sells at a premium. It is difficult to obtain the quantities needed. Foreign offers on crepe are scarce and bids have been refused with counter-offers higher.

Spot	Today	Month Ago	Year Ago
First Latex	20⅝	23⅜	17¾
Ribs	19⅞	23	17½
Up River Fine	22	23¾	17½

MAY 2. Prices fluctuated narrowly during the day but due to lack of real factory interest and buying power together with lower Exchange prices, dealers shaded selling prices for ribs yet held firmly to crepe. Enough rubber is coming in and factories do not follow up the slightest advance.

Spot	Today	Month Ago	Year Ago
First Latex	20⅜	23½	17¾
Ribs	19⅝	23⅛	17¾
Up River Fine	22	23¾	17½

MAY 3. Due to the ½-cent advance on the Exchange, and a fair demand for May and June by factory interests, and to the scarcity of standard ribs and first latex crepe, the market advanced. There seems to be a little surplus of good ribs, and first latex crepe is held at a premium because those making deliveries on May contracts for First Latex Crepe find it difficult to meet their requirements in this grade. If the demand for nearby rubber continues, there might be a squeeze towards the end of the month. The market closed firm although no acute buying was in evidence.

Spot	Today	Month Ago	Year Ago
First Latex	20⅝	22⅝	18⅜
Ribs	19⅞	22¼	18⅛
Up River Fine	22	23	18

MAY 4. Prices stiffened because of the higher Exchange figures, but practically no factory interest was evident and few sales were reported.

Spot	Today	Month Ago	Year Ago
First Latex	20¾	23¼	18⅜
Ribs	20	22⅝	18⅛
Up River Fine	22	23⅛	18

MAY 6. With slightly higher London and Exchange prices, factories refused to follow the advance registered on the Exchange and reports showed very little business, if any, being transacted during the day. Prices were practically unchanged from Saturday.

Spot	Today	Month Ago	Year Ago
First Latex	21	23¼	19⅜
Ribs	20¼	22⅝	19⅛
Up River Fine	22	23¼	20

MAY 7. On account of strength on the Exchange and lack of C I F offerings from Colombo and Singapore, and especially London, prices advanced ½ to 5/8-cent with dealers reserved. There was a little factory buying for nearby rubber but buyers would not follow up the advance and awaited further developments.

Spot	Today	Month Ago	Year Ago
First Latex	21⅝	23⅛	18⅞
Ribs	20⅜	22½	18¾
Up River Fine	22¾	23¼	18½

MAY 8. With higher prices in London and the Far East and with very little shipment rubber offered, prices continued their advance of ½-cent with dealers reserved. Little factory business was recorded at the advanced figures. Factories bid sparingly and were disinclined to

New York Quotations

Following are the New York open market rubber quotations for one year ago, one month ago and May 25, the current date

Plantation Hevea	May 25, 1928	April 25, 1929	May 25, 1929
Rubber latex (Hevea)...gal.	$1.50 @	$1.40 @	$1.50 @
CREPE			
First latex spot	.19¼ @	.20¼ @.20½	.22 @.22¼
May-June	.19¼ @	.20½ @	.22⅛ @.22¼
July-Sept.	.19½ @	.20¾ @	.22½ @.22⅝
Oct.-Dec.	.19¾ @	.21⅛ @	.22⅞ @.23
Jan.-Mar.	.20 @	@	.23¼ @.23½
Off latex, spot	.19 @	.20 @	.21¾ @
"B" Blanket, spot	.18¼ @	.18½ @	.19½ @
May-June	.18¼ @	.18⅛ @.18¼	.19¾ @
July-Sept.	.18½ @	.18⅜ @	.20¼ @
Oct.-Dec.	.18¾ @	.18⅝ @	.20½ @
Jan.-Mar.	.19 @	@	.20¾ @.21
"C" Blanket, spot	.17¾ @	.17⅞ @	.19¾ @
Brown No. 1	.17¾ @	.18¼ @	.19½ @
Brown No. 2	.17¾ @	.17⅞ @	.19¼ @
Brown, roll	.17 @	.13 @	.15¼ @
Sheet			
Ribbed, smoked spot	.19 @	.19¾ @	.21¼ @
May-June	.19⅛ @	.19⅞ @	.21½ @
July-Sept.	.19⅜ @	.20⅜ @	.21⅞ @.22
Oct.-Dec.	.19¾ @	.20¾ @	.22¼ @.22½
Jan.-Mar.	.19⅞ @	@	.22½ @.23
East Indian			
PONTIANAK			
Banjermasin	.09 @.09¾	@	@
Pressed block	.14¾ @.15	.16 @	.15 @.16
Sarawak	.09¾ @	@	@
South American			
PARAS			
Upriver, fine	.20 @	.21¼ @	.23 @
Upriver, fine	*.26 @	@	*.28 @
Upriver, coarse	.14 @	.12¾ @	.13¾ @
Upriver, coarse	*.18 @	@	*.20 @
Islands, fine	.22 @	.18 @	.20½ @
Islands, fine	*.25 @	@	*.27½ @
Acre, Bolivian, fine	.20 @	.21¼ @	.23½ @
Acre, Bolivian, fine	*.26 @	@	*.29 @
Beni, Bolivian	.20½ @	.22 @	.23¾ @
Madeira, fine	.19½ @	.21¼ @	.23 @

South American	May 25, 1928	April 25, 1929	May 25, 1929
PARAS—*Continued*			
Peruvian, fine	$0.19 @	$0.20 @	$0.21½ @
Tapajos, fine	.18 @	.20 @	.21½ @
CAUCHO			
Upper caucho ball	.14 @	.12¾ @	.13¾ @
Upper caucho ball	*.22 @	@	*.20 @
Lower caucho ball	.13 @	.12¼ @	.13 @
Maniçobas			
Ceará negro heads	†.17 @	†.20 @	†.20 @
Ceará scrap	†.09 @	†.12 @	†.12 @
Manicoba, 30% guaranteed	†.19 @	†.22 @	†.22 @
Mangabiera, thin sheet	†.19 @	†.22 @	†.22 @
Centrals			
Central scrap	.16 @	.11½ @.12½	.12 @.13
Central wet sheet	.12 @	@	@
Corintò scrap	.16 @	@	@
Esmeralda sausage	.16 @	.11½ @.12½	.12 @.13
Guayule			
Duro, washed and dried	.20 @	.20 @	.20 @
Ampar	.21 @	.21½ @	.21½ @
Gutta Percha			
Gutta Siak	.18 @	.20 @	.20 @
Gutta Soh	.30 @.32	@	@
Red Macassar	2.80 @3.00	3.00 @	2.90 @
Balata			
Block, Ciudad Bolivar	.38 @	.51 @	.52 @.54
Colombia	.44 @	@	.49 @
Manaos block	.44 @	.58 @	.57 @.58
Panama	.44 @	@	@
Surinam sheet	.50 @.51	.52 @	.54 @.56
Amber	.52 @	.53½ @	.58 @.60
Chicle			
Honduras	‡.64 @	‡.68 @	‡.66 @
Yucatan, fine	‡.64 @	‡.68 @	‡.66 @

*Washed and dried crepe. Shipment from Brazil.
†Nominal. ‡Duty paid.

New York Outside Market—Spot Closing Rubber Prices—Cents Per Pound

	May, 1929					
PLANTATIONS	20	21	22	23	24	25
Sheet						
Ribbed smoked	23⅝	22¾	22½	21⅝	21⅜	21⅞
Crepe						
First latex	24⅛	23¼	23	22¼	21¾	22¼
"B" blanket	21⅝	20¾	20½	19⅞	19⅝	19⅞
"C" blanket	21⅜	20½	20¼	19½	19¼	19½
"D" blanket	20⅞	20	19⅞	19	18¾	19
No. 2 brown	21⅜	20½	20¼	19½	19¼	19⅝
Rolled brown	16⅞	15¾	15½	15	14½	14⅞
Off latex	23¾	23	22⅝	21⅞	21½	21⅞

Low and High New York Spot Prices

PLANTATIONS	1929*	May 1928	1927
First latex crepe	$0.20¼ @$0.24¼	$0.17½ @$0.20⅜	$0.41 @$0.41¾
Smoked sheet, ribbed	.19½ @ .23½	.17½ @ .20¼	.40½ @ .41¼
PARAS			
Upriver, fine	.21¾ @ .25¼	.18½ @ .21	.32½ @ .37
Upriver, coarse	.12¾ @ .16½	.14¼ @ .17	.23½ @ .26¾
Islands, fine	.19¾ @ .23¼	.....@.....	.28 @ .32

*Figured to May 25, 1929.

purchase on the advance of the past two days believing the market was overdone on the upside and that a reaction was due, preferring to await the Rubber Association reports which are due in a few days.

Spot	Today	Month Ago	Year Ago
First Latex	22⅛	23	19⅜
Ribs	21½	22½	19⅛
Up River Fine	23½	22	20

MAY 9. The market held steady because of slight advance in London and higher prices on shipment rubber. Factory buying was meager, and factories refused to follow up price advances. Very little business was reported. First latex crepe is still very scarce.

Spot	Today	Month Ago	Year Ago
First Latex	21¾	23⅛	18⅞
Ribs	21	22⅜	18¾
Up River Fine	23¼	23¼	19

MAY 10. Prices were easier in sympathy with the Exchange, and due to lack of factory demand very little business was transacted. Buyers preferred to wait the turn of the week before making new commitments as their immediate needs seem satisfied.

Spot	Today	Month Ago	Year Ago
First Latex	21¾	23	18⅞
Kibs	21	22⅜	18¾
Up River Fine	23¼	23¼	19

MAY 11. Saturday's half session was a dull affair as usual with practically no business reported.

Spot	Today	Month Ago	Year Ago
First Latex	21¾	23⅛	18⅞
Ribs	21	22⅜	18¾
Up River Fine	23¼	23¼	19

MAY 13. Due to lack of eastern offers and also to the high prices asked, prices advanced quickly. Dealers were eager buyers and picked up all C I F offers and bid for more. This advance was due to the expected high consumption for April which finally was reported at 47,521 tons which was the largest monthly consumption on record. This caused a very bullish demonstration throughout the market.

Spot	Today	Month Ago	Year Ago
First Latex	22¾	23¼	19¼
Ribs	21⅞	22⅜	18⅞
Up River Fine	24	23¼	19¼

MAY 14. With higher London cables and no offers of C I F rubber, prices advanced ½ to 5/8-cent on all grades and positions. Dealers were reluctant to sell and factories, although nibbling with low bids, procured little rubber and appeared waiting before making further commitments.

Spot	Today	Month Ago	Year Ago
First Latex	23¼	23⅛	19⅛
Ribs	22½	22⅜	18⅞
Up River Fine	24½	23¼	19¼

MAY 15. With higher London cables and practically no rubber offered from the Far East, prices advanced nearly one cent, but on the subsequent break of 90 points factories entered the market and took fair weights for various positions. On shipment rubber little was done because of the high prices asked by foreign accounts.

Spot	Today	Month Ago	Year Ago
First Latex	23	22¼	19⅛
Ribs	22⅛	21½	18⅞
Up River Fine	24¼	23	19

MAY 16. Shipment offers were limited and little buying by first hands reported although factories were nibbling hoping for a further break to pick up fair quantities.

Spot	Today	Month Ago	Year Ago
First Latex	23	22¼	19¼
Ribs	22¼	21½	19
Up River Fine	24¼	23	19

MAY 17. With few high offers from the Far East, dealers offered rubber sparingly and at high figures so that prices were 3/8 to one cent up from the previous close. Factories were doing nothing, and little business was reported.

Spot	Today	Month Ago	Year Ago
First Latex	23½	21⅞	19
Ribs	22⅞	21	18¾
Up River Fine	24¾	22½	19

MAY 18.—With reports from all centers that consumption was continuing at high levels, dealers were rather conservative, but with the advance on the Exchange the result was that at the close and in the late afternoon dealers entered the market and picked up practically all C I F offers at top prices. The market closed firm.

Spot	Today	Month Ago	Year Ago
First Latex	23½	21⅞	19
Ribs	22⅞	21	18¾
Up River Fine	24¾	22½	19

MAY 20. Practically no business was consummated because of lack of knowledge of the London and the Eastern markets. Factories and dealers marked time although dealers held prices at high figures due to the advance of 10 to 20 points on the Exchange.

Spot	Today	Month Ago	Year Ago
First Latex	24½	20⅜	19
Ribs	23½	19⅝	18¾
Up River Fine	25¼	21½	19

MAY 21. With high prices asked for actual rubber on Saturday and Monday owing to the advance on the Exchange and the uncertainty of what the foreign markets might do, factories and dealers kept out of the market. When there was no advance in London, prices eased off in sympathy with the decline on the Exchange and closed about 3/4 to one cent lower in all positions. Very little business was transacted.

Spot	Today	Month Ago	Year Ago
First Latex	23⅜	20⅜	19
Ribs	22⅝	19⅝	18¾
Up River Fine	24½	21½	19

MAY 22. Although prices were lower than on the previous day, dealers were anxious as there were few offers from the Far East and dealers preferred to wait before making sales. There was good factory buying in the Far East which made it difficult for the dealers to obtain the rubber desired.

Spot	Today	Month Ago	Year Ago
First Latex	23	20⅝	19
Ribs	22⅜	19¾	18¾
Up River Fine	24¼	22¼	19

MAY 23. Very little factory business was reported although some factories inquired for small quantities, but owing to the uncertainty of credit conditions and rediscount rate, buyers were reserved. Business was dull and the market erratic.

Spot	Today	Month Ago	Year Ago
First Latex	22½	21⅛	19¼
Ribs	21¾	20⅜	19
Up River Fine	24	22¾	19¼

MAY 24. Factories were entirely out of the market. There was little demand for actual rubber although certain C I F offers were taken up by dealers on this decline early in the day. At the close with the continued easiness on the Exchange, prices declined in a dull market.

Spot	Today	Month Ago	Year Ago
First Latex	22	20½	18⅞
Ribs	21¼	19¾	18⅝
Up River Fine	23	22¼	18

MAY 25. With the strength in London and higher Exchange prices, no business was transacted as dealers practically refused to quote prices until they saw further developments in London on Monday. On account of continued strength in the Singapore market very little rubber was obtainable.

Spot	Today	Month Ago	Year Ago
First Latex	22	20¾	18¾
Ribs	21¼	19⅝	18½
Up River Fine	23	22¼	18

World Rubber Absorption—Net Imports

Long Tons—1929

	Total 1928	Jan.	Feb.	Mar.
Australia	8,430	1,061	1,131	725
Belgium	7,958	749	627	931
Canada	30,447	3,759	2,908	4,961
Czechoslovakia	3,138	525	356	.....
Denmark	566	38	49	60
Finland	768	62	34	5
France	36,498	5,645	5,001	.....
Germany	37,855	4,711	4,613	4,586
Italy	12,433	1,481	1,259	1,515
Japan	25,621	3,776	2,727	.....
Netherlands	2,243	218	113	316
Norway	728	70	48	55
Russia	15,134	956	.....	.....
Spain	3,178	179	115	.....
Sweden	2,356	468	95	234
United Kingdom	4,846	11,951	5,179	9,068
United States	404,496	53,922	61,331	46,391
U. S. (Guayule)	3,076	.....	.....	.....
Totals	599,771	.....	.....	.....

Compiled by Rubber Division, Department of Commerce, Washington, D. C.

World Rubber Production—Net Exports

Long Tons—1929

British Malaya:	Total 1928	Jan.	Feb.	Mar.	Apr.
Gross exports	409,500	52,546	47,926	49,448	49,816
Imports	149,787	13,415	12,103	14,553	11,414
Net	259,713	39,131	35,823	34,895	38,402
Ceylon	57,267	8,301	6,943	6,713	4,676
India and Burma	10,790	1,664	1,117	1,413	.....
Sarawak	10,087	873	955	758	747
B. N. Borneo	6,698	*500	*500	*500	*500
Siam	4,813	461	495	499	306
Java and Madura	58,848	5,640	6,572	5,515	.....
Sumatra East Coast	82,511	8,067	7,511	6,620	.....
Other N. E. Indies	121,671	11,535	10,384	10,629	.....
French Indo-China	9,616	395	965	741	568
Amazon Valley	21,129	2,134	2,104	2,332	1,950
Other America	1,490	.....	.....	.....	.....
Mexican Guayule	3,076	.....	.....	.....	.....
Africa	6,124	.....	.....	.....	.....
Totals	653,833	.....	.....	.....	.....

* Estimated.

Compiled by Rubber Division, Department of Commerce, Washington, D. C.

April Imports

Importations of all grades of rubber in April, 1929, were 54,171 tons, compared with 37,240 tons for April, 1928. Plantation arrivals for April, 1929, were 53,256 tons, compared with 36,108 tons a year ago. Total imports for four months ended April 30, 1929, were 224,838 tons, compared with 153,822 tons for the same period one year ago.

Rubber Afloat to the United States

All figures in long tons.

Week Ended	British Malaya	Ceylon	Netherland East Indies	London and Liverpool	Total
Apr. 27...	7,808	1,212	1,723	108	10,851
May 4...	6,573	888	2,374	166	10,001
May 11...	6,798	852	1,148	213	9,011
May 18...	8,026	1,011	2,028	126	11,191
May 25...	7,020	558	2,070	115	9,763

Rubber Consumption High

Consumption of crude rubber during April created a new high monthly record with a total of 47,521 tons. Consumption in March, which held the record formerly, totaled 44,287, while in April last year 32,450 tons were consumed. For the four months to the end of April the total has aggregated 176,847 tons, against 129,793 tons for the corresponding 1928 period, a gain of 47,054 tons, or 36 per cent.

Imports of crude rubber during April were also heavy, running well ahead of consumption. The total is placed at 54,171 tons. In March imports were 53,824 tons, while in April last year they totaled 37,240 tons. Imports for the first four months this year aggregated 224,838 tons, compared with 153,822 tons a year ago, a gain of nearly 45 per cent. As a result of the heavy imports of crude rubber, stocks on hand continue to increase. At the end of April they totaled 107,659 tons, against 100,537 tons at the end of March.

How Many Encores for Reclaim?

Experiments have convinced Geo. W. Miller that there is little justification for the assertion that reclaim has more lives than a cat, or may make as many successful farewell appearances as an operatic diva, without degenerating through repeated transmutations. Having cured a compound containing whole tire reclaim made by the sodium hydroxide process, he repeated the cure three times with the regenerated rubber. While tensile strength held up well through the several cycles, the vulcanizates otherwise showed progressive deterioration. In brief, all tests indicated that the physical properties of rubber repeatedly reclaimed and recured diminish through each recurring operation.

Many Uses for Rubberseed Oil

The production and marketing of rubberseed oil have developed into a new industry in the vegetable oil field, and the product is likely to find extensive use in the United States in the making of rubber substitute or factice, in the ink trade, and as a substitute for linseed oil in manufactures other than soft soap. Experiments made with rubberseed meal in the Federated Malay States are said to show it to be free from alkaloids or poisonous compounds like saponin. The cake is sold largely in the United Kingdom for cattle feed.

RECLAIMED RUBBER

RUBBER-GOODS production especially tires and tubes, has been maintained at high levels for the first quarter of this year, resulting in a correspondingly active demand for reclaim of all types.

Official statistics of reclaim consumption for the first quarter show that over 60,000 tons have been used in that period. The ratio of reclaim to crude rubber consumption is maintained at 50 per cent notwithstanding the advance in tonnage of crude being used.

Quotation of most grades of reclaim remain unchanged with slight reductions in effect on the highest types, namely, tire and inner-tube stocks.

During the next three months production at capacity will be necessary on the part of reclaimers to meet the very active demands of consumers. In general, reclaims are very favorable values at present levels.

The standard grades are listed and quoted as follows:

New York Quotations

May 25, 1929

High Tensile	Spec. Grav.	Price Per Pound
Super-reclaim, black	1.20	$0.12½@$0.13
red	1.20	.12½@ .13
Auto Tire		
Black	1.21	$0.08 @$0.08½
Black selected tires	1.18	.08½@ .09
Dark grav.	1.35	.10 @ .10½
Light gray	1.38	.12 @ .12½
White	1.40	.13 @ .13½
Shoe		
Unwashed	1.60	.07¼@ .07½
Washed	1.50	.10 @ .10¼
Tube		
No. 1	1.00	.13½@ .14
No. 2	1.10	.10½@ .11
Miscellaneous		
Red	1.35	.12½@ .13
Truck tire, heavy gravity	1.55	.07 @ .07¼
Truck tire, light gravity	1.40	.07½@ .07¾
Mechanical blends	1.60	.07 @ .07½

RUBBER SCRAP

RUBBER scrap grades (except tires) were distinctly duller in May than in April, and prices were weaker. Mixed auto tires with beads were the only item in the list below that showed any advance and that was but 50 cents a ton. Business is active and prices extremely competitive.

Boots and shoes were easier and collections very heavy, the black grades being quoted 1⅜ cents, flat, down ⅛ from the April quotation. Untrimmed arctics were down ¼-cent. Tennis were steady at ¾-cent flat.

Pneumatic tires were stronger and in better demand. Mixed tires with beads advanced 50 cents a ton to $25, while mixed peelings declined the same amount to $36.50 a ton. The remaining grades of pneumatic tire scrap qualities remained unchanged.

Inner tubes. No. 1 grade has declined ½-cent a pound. No. 2, red and mixed grades remained steady at April quotations.

Air brake scrap was in very poor demand, and the price has fallen off $4 a ton. White, red, and all other grades of mechanical scrap were dull.

CONSUMERS' BUYING PRICES

Carload Lots

May 25, 1929

Boots and Shoes	Prices
Boots and shoes, black....lb.	$0.01⅜@
Untrimmed arctics.....lb.	.00¾@ .01
Tennis shoes and soles...lb.	.00¾@
Hard Rubber	
No. 1 hard rubber.....lb.	$0.08 @$0.08½
Mechanicals	
Mixed black scrap.....lb.	.00½@ .00⅝
Hose, air brake.....ton	28.50 @29.50
regular soft .....lb.	.00¾@
No. 1 red.....lb.	.02 @ .02¼
No. 2 red .....lb.	.01 @ .01½
White druggists' sundries.lb.	.02 @ .02½
Mechanical .....lb.	.01¼@ .01⅝
Tires	
Pneumatic Standard—	
Mixed auto tires with beads .....ton	25.00 @26.00
Beadless .....ton	33.00 @34.00
White auto tires with beads .....ton	40.00 @42.00
Beadless .....ton	48.00 @49.00
Mixed auto peeling.....ton	36.50 @38.50
Solid—	
Mixed motor truck, clean .....ton	23.50 @25.00
Inner Tubes	
No. 1, floating.....lb.	.06½@ .06¾
No. 2, compounded.....lb.	.04¼@ .04⅜
Red .....lb.	.05 @ .05¼
Mixed tubes .....lb.	.04½@

Imports, Consumption and Stocks

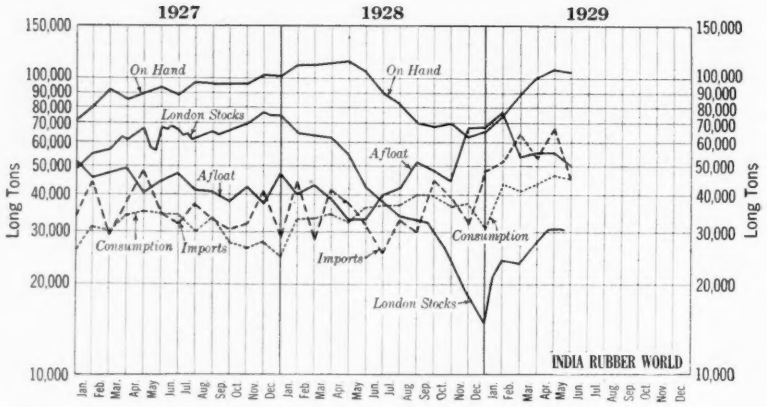
The accompanying graph covers crude rubber importations, consumption and stocks by months for the years 1927 to 1928, inclusive, and for January to May, inclusive, 1929. The figures for May are estimated.

The corrected imports for April totaled 74,171 tons or 12,171 tons over the estimated amount.

The corrected consumption for April was 47,051 tons or 4,051 more than estimated.

May estimated imports are placed at 45,000 tons. The other estimates for May are: consumption 45,000 tons, on hand 104,600 tons, and afloat 50,000 tons.

Imports and consumption for the first quarter of 1929 were as follows: imports 170,657 tons, consumption 129,324 tons.



United States Imports, Consumption and Stocks

London stocks have been above 28,000 tons since April 13. The record from April 27 to May 25, inclusive, is as follows: April 27, 31,213 tons; May 4, 31,580 tons; May 11, 31,127 tons; May 18, 30,955 tons; May 25, 28,935 tons.

Twelve Months	Imports Tons	Consumption Tons	Stocks On Hand Tons	Stocks Afloat Tons	London Tons	Singapore and Penang Tons
1925	384,837	389,136	51,000*	48,000*	.....	.....
1926	411,900	366,140	72,510*	52,019*	.....	.....
1927	426,258	370,915	100,130*	47,939*	63,207*	25,868*
1928	448,378	441,336	66,166*	68,764*	24,423†	34,432*
1929						
January	52,305	43,000	76,342	78,596	24,423	33,119
February	64,528	41,594	90,058	53,825	25,000	.....
March	53,824	44,730	100,537	56,476	28,077	33,784
April	74,171	47,051	107,659	55,409	31,213	.....
May (est.)	45,000	45,000	104,600	50,000	.....	.....

*December 31. †January 26.

The 1928 figures, unless otherwise specified, are all as of the first of each month.

Ceylon Rubber Exports

January 1 to February 28, 1929

	Tons
To United Kingdom	3,094.87
Continent	1,342.99
Australia	505.54
America	10,408.24
Egypt	2.00
Africa	1.94
India	7.87
Japan	47.00
Total	15,410.45
For the same period last year	8,711.15

Annual Exports, 1921-1928

	Tons
For the year 1928	57,825.48
1927	55,355.77
1926	58,799.56
1925	45,697.19
1924	37,351.13
1923	37,111.88
1922	47,367.14
1921	40,210.31

Netherlands East Indies Exports

	Total 1928	Long Tons—1929 Jan.	Feb.	Mar.
Java and Madura	58,848	5,640	6,572	5,515
Sumatra East Coast	82,511	8,067	7,511	6,620
Atjeh and Dep	4,046	416	....	....
Riouw and Dep	9,558	1,099	....	....
Djambi	32,810	2,643	....	....
Palembang	18,220	1,949	2,038	....
Lampongs District	2,994	229	313	....
Benkoelen	49	3	3	....
Sumatra West Coast	1,080	123	132	....
Tapanoeli	5,753	543	612	....
Banka and Dep	485	41	33	....
Billiton	282	45	....	....
West Borneo	21,553	2,079	....	....
S. and E. Borneo	24,573	2,352	....	....
Celebes	268	13	....	....
Totals	263,030	25,242		

Tire Production Statistics

United States tire manufacturers produced a total of 7,519,234 pneumatic casings during March, 1929. Total production of inner tubes is estimated at 7,466,380, and total production of solid and cushion tires at 47,800 for the month.

Total shipments during March are estimated as follows: pneumatic casings, all classes, 6,708,134; inner tubes, 6,737,688; solid and cushion tires, 54,285.

Inventories as of March 30, 1929, are estimated as 16,351,750 for all pneumatic casings; 17,750,180 for inner tubes; and 190,920 for solid and cushion tires.

The tire industry is estimated to have consumed a total of 81,780,500 pounds of crude rubber, and 28,317,800 pounds of cotton fabric during March, in the manufacture of all types of pneumatic casings, inner tubes, and solid and cushion tires.

	High Pressure Pneumatic Casings: All Types Inventory	Production	Total Shipments	Cord Inventory	Production	Total Shipments
1928	.....	58,457,863	55,721,937	.....	19,302,218	19,351,380
1929						
January	10,284,158	5,041,530	4,969,647	3,651,041	1,563,554	1,461,104
February	11,620,960	5,183,693	3,961,751	4,073,644	1,373,691	974,185
March	12,263,816	5,639,426	5,031,101	4,330,747	1,397,657	1,157,188

	Balloon Casings Inventory	Production	Total Shipments	Solid and Cushion Tires Inventory	Production	Total Shipments
1928	.....	38,878,218	35,931,982	.....	508,223	512,602
1929						
January	6,583,958	3,470,596	3,499,121	150,555	31,927	33,537
February	7,472,592	3,796,660	2,976,698	147,165	30,211	31,904
March	7,858,642	4,229,586	3,863,650	149,190	35,857	40,714

	High Pressure Inner Tubes Inventory	Production	Total Shipments	Balloon Inner Tubes Inventory	Production	Total Shipments
1928	.....	23,255,891	23,749,966	.....	36,878,990	34,095,223
1929						
January	4,734,477	1,540,272	1,800,676	6,805,018	3,347,660	3,630,579
February	5,159,171	1,398,156	1,046,042	7,572,752	3,675,116	2,908,406
March	5,356,289	1,475,822	1,276,490	7,938,587	4,120,493	3,773,585

	Cotton and Rubber Consumption Casings, Tubes, Solid and Cushion Tires: Cotton Fabric Pounds	Crude Rubber Pounds
1928	222,243,398	600,423,401
1929		
January	19,779,481	54,160,520
February	20,326,530	57,558,636
March	21,238,410	61,335,423

Rubber Manufacturers Association figures representing 75 per cent of the industry.

Rubber Latex Conversion

As regards rubber latex, United States import figures are reported in United States gallons, while the British Malayan export figures report in Imperial gallons. For United States imports, rubber latex is converted to dry weight by multiplying by 3 pounds per gallon. For the British Malayan exports, conversion is customarily made by multiplying by 3½ pounds per Imperial gallon.

Compounding Ingredients

THE demand for compounding ingredients has been active by manufacturers of all lines of rubber goods. Plants making tires, tubes, and accessories are operating to capacity. The output of mechanical goods is also on a liberal scale and increasing in tonnage. Prices of ingredients are firm and several new materials of special interest are being offered this month to compounders.

ACCELERATORS. This class of materials is under constant study and development by the research laboratories with the object of perfecting long range curing, non-scorching and low-temperature accelerators. Two of this class have recently been announced—Ureka for either high or low temperatures, and Accelerator 833, especially for curing rubber footwear.

ANTIOXIDANTS. These antiagers are separable into groups according to their special adaptability as preventives against oxidation, surface weathering, and fatigue inhibition. They are offered in a variety that admits choice in these particulars.

BENZOL. Production is heavy owing to the full-time operation of the steel industry. The demand has been equally strong and prices firm.

CARBON BLACK. The rubber industry's consumption continues very heavy. Spot demand is limited, the bulk of the movement being on contracts. Prices are firm.

CLAY. Clays of special quality are firmly established in the rubber industry as the best cheap reenforcing ingredient available. This material is practically as staple as any ingredient of much older acceptance.

LITHARGE. There is a steady seasonal consumption of litharge and the demand is improving. Prices are steady and unchanged.

MINERAL RUBBER. The usual heavy consumption shows steady increase. A new and promising future candidate in this field was noticed at the recent Chemical Show in New York.

SOFTENERS. An addition has been made recently to this large group of ingredients. The new material is Whitco No. 20, a special lubricant for rubber compounding, said to have outstanding features of economy and desirable physical effect.

SOLVENT NAPHTHA. Free movement, improved demand, and steady prices characterized the market for this solvent.

V. M. P. NAPHTHA. The consuming demand is good although early in the month the small lot demand was reported routine. This grade is the principal solvent for rubber cements.

STEARIC ACID. The market shows no new features. The demand is normal and the tone easier.

ZINC OXIDE. As the past month advanced, the demand was much improved, and prices were firm, although zinc metal prices were reduced the last of April.

New York Quotations

May 25, 1929

Accelerators, Inorganic

Lead, carbonate	lb.	$0.09	@
Lead, red	lb.	.10½	@
sublimed white	lb.	.08½	@
sublimed blue	lb.	.08½	@
super-sublimed white lead	lb.	.08¾	@
Lime, R. M. hydrated	ton	20.00	@
Litharge	lb.	.09½	@
Magnesia, calcined heavy	lb.	.04	@ .04½
Magnesia carbonate	lb.	.08¾	@ .11
Orange mineral A.A.A.	lb.	.12½	@

Accelerators, Organic

A-7	lb.	.55	@ .65
A-11	lb.	.62	@ .75
A-16	lb.	.57	@ .65
A-19	lb.	.58	@ .75
A-20	lb.	.64	@ .80
A-32	lb.	.80	@ .95
Aero X	lb.	.60	@ .65
Albasan	lb.	.70	@ .75
Aldehyde ammonia	lb.	.65	@ .70
B. B.	lb.		@
Captax	lb.		@
Crylene, hard form	lb.		@
Paste	lb.		@
D. B. A.	lb.	2.00	@
Di-ortho-tolylguanidine	lb.	.42	@ .44½
D. P. G.	lb.	.30	@ .32½
Ethylidine aniline	lb.	.45	@ .47½
Formaldehyde aniline	lb.		@
Grasselerater 102	lb.		@
552	lb.		@
808	lb.		@
833	lb.		@
Heptene	lb.	.40	@
Hexamethylenetetramine	lb.	.58½	@ .61
Lead oleate, No. 999	lb.	.16	@
Witco	lb.	.14	@
Lithex	lb.	.18	@ .20
Methylene dianiline	lb.	.37½	@ .40
Monex	lb.	3.25	@
Plastone	lb.		@
R-2	lb.	2.00	@ 2.50
R. & H. 40	lb.	.40	@ .42½
50	lb.	.40	@ .42½
Safex	lb.	1.20	@
Sunproof	lb.	.50	@
Super-sulphur, No. 1	lb.		@
No. 2	lb.		@
Tensilac No. 39	lb.	.40	@ .42½
No. 41	lb.	.50	@ .52½
Thermlo F.	lb.	.50	@ .55
Thiocarbanilid	lb.	.23	@ .27
Trimene	lb.	.75	@
base	lb.	1.20	@
Tuads	lb.		@
ZBX	lb.	2.50	@
Z-88	lb.	.50	@ .60
Zimate	lb.		@

Acids

Acetic 28% (bbls.)	100 lbs.	3.88	@ 4.13
glacial (carboys)	100 lbs.	14.18	@14.43
Sulphuric, 66°	100 lbs.	1.60	@

Alkalies

Caustic soda, 76% solid,	100 lbs.	2.90	@

Anti-Oxidants

Age-Rite, powder	lb.		@
resin	lb.		@
white	lb.		@

Anti-Oxidants—(*Continued*)

Antox	lb.		@
Grasselerager A	lb.		@
Resistox	lb.	$0.54	@ $0.65
Stabilite	lb.	.64	@
V. G. B.	lb.		@

Colors

BLACK

Bone	lb.	.07	@
Carbon (see compounding ingredients)			
Drop	lb.	.05½	@ .15
Lampblack (commercial)	lb.	.07	@ .08

BLUE

Akco blue	lb.	1.80	@
Huber Brilliant	lb.	4.20	@ 4.70
Prussian	lb.	.35	@ .55
Ultramarine	lb.	.09	@ .25

BROWN

Huber Mocha	lb.	1.60	@ 2.10
Sienna, Italian, raw	lb.	.05½	@ .12½

GREEN

Akco green	lb.	2.60	@
Chrome, light	lb.	.27	@ .31
medium	lb.	.28	@ .31
Huber Brilliant	lb.	4.35	@
Oxide of chromium	lb.	.31	@ .38

ORANGE

Huber Persian	lb.	.50	@ 1.00

RED

Akco red	lb.	2.75	@
Antimony			
Crimson	lb.	.50	@ .55
Sulphur free	lb.	.58	@ .65
Crimson, R. M. P. No. 3	lb.	.48	@
Sulphur, free	lb.	.52	@
Vermilion, No. 5	lb.		@
No. 15	lb.		@
Golden, No. 40	lb.		@
No. 60	lb.		@
15/17%	lb.	.21	@ .23
7-A	lb.	.35	@
Z-2	lb.	.22	@
Aristi	lb.	2.75	@
Huber Brilliant	lb.	1.35	@ 1.85
Iron Oxides			
bright pure domestic	lb.	.12	@
bright pure English	lb.	.12	@
bright reduced English	lb.	.10	@
bright reduced domestic	lb.	.10	@
Indian (maroon), pure domestic	lb.	.11	@
Indian (maroon), pure English	lb.	.10½	@
Indian (maroon), reduced English	lb.	.07	@
Indian (maroon), reduced domestic	lb.	.08	@
Oximony	lb.	.13¼	@
Spanish red oxide	lb.	.03	@ .04¼
Sunburnt red	lb.	.14¼	@
Venetian reds	lb.	.02	@ .06
Vermilion, Eng. quicksilver	lb.	1.95	@

Colors—(*Continued*)

WHITE

Lithopone	lb.	$0.05½	@
Albalith	lb.		@
Azolith	lb.	.05¼	@ .05¾
Grasselli	lb.	.05¼	@ .05¾
Sterling	lb.		@
Vanolith	lb.	.05½	@ .05¾
Titanox	lb.	.09½	@ .10
Zinc Oxide			
AAA (lead free)	lb.	.07	@
Azo (factory):			
ZZZ (lead free)	lb.	.06½	@ .07
ZZ (leaded)	lb.	.06¼	@ .06¾
Z (8% leaded)	lb.	.06¼	@ .06¾
Green seal	lb.		@
Kadox	lb.		@
Red seal	lb.		@
Special	lb.		@
White seal	lb.		@
XX green label	lb.		@
XX red label	lb.		@

YELLOW

Akco yellow	lb.	1.45	@
Cadmium sulphide	lb.	.95	@ 1.75
Chrome	lb.	.17	@ .17½
Grasselli cadmium	lb.		@
Huber canary	lb.	3.30	@ 3.80
Ochre, domestic	lb.	.01½	@ .02½
Ochre, French	lb.	.02	@
Oxide, pure	lb.	.08½	@
Zinc, C. P., imported	lb.	.23	@

Compounding Ingredients

Aluminum flake (sacks, c.l.)	ton	21.85	@
(sacks l.c.l.)	ton	24.50	@
Ammonium carb. pwd.	lb.	.13	@ .17
lump	lb.	.12	@ .16
Asbestine	ton	13.40	@14.50
Barium, carbonate	ton	58.00	@60.00
Baryta white (f.o.b. St. Louis, bbls.)	ton	23.00	@
Baryta white (f. o. b. St. Louis, paper bags)	ton	22.20	@
Barytes, pure white	ton	35.00	@
off color	ton	25.00	@
medium	ton	27.50	@
Foam "A" (f. o. b. St. Louis, bbls.)	ton	23.00	@
Foam "A" (f. o. b. St. Louis, bags)	ton	23.00	@
Basofor	lb.	.04½	@
Blanc fixe, dry	lb.	.04½	@
pulp	ton	42.50	@45.00
Carbon Black			
Aerfloted arrow	lb.	.08½	@ .12
Compressed	lb.	.08½	@ .12½
Fumonex	lb.	.06	@ .09
Micronex	lb.	.09	@ .13
Uncompressed	lb.	.08	@ .12
Velvetex	lb.	.04½	@ .06
Carrara filler	ton		@
Chalk	ton	12.00	@
Clay, Blue Ridge, dark	ton		@
Blue Ridge, light	ton		@
China	lb.	.01¼	@
Dixie	ton		@
Langford	ton		@
Mineral flour (Florida)	ton		@
Perfection	ton	30.00	@
Suprex	ton	10.00	@22.00
Tensulite	ton	25.00	@

Compounding Ingredients *(Continued)*

Cotton flock, black	lb.	$0.13	@
light-colored	lb.	.10	@ .11
white	lb.	.12	@ .30
Glue, high grade	lb.	.25	@ .30
low grade	lb.	.16	@ .22
Infusorial earth	ton	45.00	@
Mica, amber (fact'y)	lb.	.04½	@
Neomerpin, S. A. conc.	lb.	.60	@
Pumice stone, powd.	lb.	.02½	@ .04
Rottenstone (bbls.)	lb.	.02½	@ .04½
Shellac, fine orange	lb.	.33	@
Soapbark	lb.	.13½	@ .14
Soapstone	ton	15.00	@22.00
Talc, domestic	ton	25.00	@
French	ton	18.00	@22.00
Pyrax A	ton		@
B	ton		@
Thermatomic carbon	lb.		@
Whiting			
Domestic	100 lbs.	1.00	@
English, cliffstone	100 lbs.	1.50	@
Quaker	ton		@
Slate flour, gray (fact'y)	ton	7.00	@
Snow white	ton		@
Sussex	ton		@
Vancolloid	ton	27.00	@
Vansulite	ton	26.00	@
Westminster Brand	100 lbs.		@
Witco (l. c. l.) (f. o. b. New York)	ton	20.00	@
Whiting, imp. chalk	100 lbs.	.95	@ 1.10
Paris White, English cliffstone	100 lbs.	1.50	@ 3.00

Factice—See Rubber Substitutes

Mineral Rubber

Fluxrite (solid)	lb.	.05	@ 06
Genasco (fact'y)	ton	50.00	@52.00
Gilsonite (fact'y)	ton	37.14	@39.65
Granulated M. R.	ton		@
Hydrocarbon, hard	ton		@
Hydrocarbon, soft	ton		@
Ohmlac Kapak, M. R.	ton	40.00	@90.00
M-4	ton	175.00	@
Paradura (fact'y)	ton	62.50	@65.00
Pioneer, M. R., solid (fact'y)	ton	40.00	@42.00
M. R. granulated	ton	50.00	@52.00
Robertson, M. R., solid (fact'y)	ton	34.00	@80.00
M. R. gran. (fact'y)	ton	38.00	@80.00
Vansul Puro	ton	27.00	@

New York Quotations

May 25, 1929

Oils

Kerosene	gal.	$0.15	@
Mineral	gal.	.22	@
Poppy seed oil	gal.	1.65	@ 1.70
Rapeseed	gal.	.86	@
Red oil, distilled	lb.	.10⅝	@ .11⅜
Rubber process	gal.	.30	@
Spindle	gal.	.35	@

Rubber Substitutes or Factice

Black	lb.	.08	@ .14
Brown	lb.	.08	@ .15
White	lb.	.09	@ .16

Softeners

Burgundy pitch	100 lbs.	5.50	@ 6.00
Atlas	100 lbs.	6.50	@
Corn oil	lb.	.10¾	@
Cottonseed oil	lb.	.10	@
Cycline oil	gal.	.26	@ .34
Degras	lb.	.03⅝	@ .04¾
Fluxrite (fluid)	lb.	.05	@ .06
Moldrite	lb.	.07½	@ .08
Palm oil (Lagos)	lb.	.09¾	@
Palm oil (Niger)	lb.	.09	@
Palm oil (Witco)	lb.	.11	@
Para-flux	gal.	.17	@
Petrolatum, snow white	lb.	.08⅜	@ .08⅝
Pigmentar	lb.	.038	@ .0446
Pine oil, steam distilled	gal.	.62	@ .63
Pine tar (retort)	bbl.	11.50	@12.00
Rosin K	bbl.	9.15	@
Rosin oil, compounded	gal.	.30	@
No. 3, deodorized	gal.	.58	@
No. 556, deodorized	gal.	.49	@
Rubite	lb.	.10½	@
Rubtack	lb.	.08½	@
Stearex	lb.	.15½	@ .20
Stearic acid, double pressed	lb.	.15½	@ .16
Tackol	lb.	.09	@ .15
Tasco W-S No. 1	lb.		@
A	lb.		@
Vansulol	lb.	.12½	@
Vantar (Pine Tar)	gal.	.35	@
Waxene	lb.	.30	@ .40
Witco No. 20	gal.	.17	@
Woburn oil	lb.	.05½	@ .06

Solvents

Benzol (90% drums)	gal.	$0.28	@
Carbon bisulphide (drums)	lb.	.05½	@ .08
tetrachloride (drums)	lb.	.06½	@ .10
Cyclohexanone	lb.	.70	@
Dip-Sol	gal.	.14	@
Dryolene, No. 9	gal.	.11½	@
Gasoline			
No. 303			
Tankcars	gal.	.15	@
Drums, c. l.	gal.		@
Drums, l. c. l.	gal.		@
Hexalin	lb.	.60	@
acetate	lb.	.70	@
Rub-Sol	gal.	.11	@
Solvent naphtha	gal.	.35	@
Stod-Sol	gal.	.11½	@
Sweet rubber cement naphtha	gal.	.16½	@
Turpentine, Venice	lb.	.20	@
steam distilled	gal.	.48	@ .52

Vulcanizing Ingredients

Sulphur			
Velvet flour (240 lb. bbls.)	100 lbs.	2.95	@ 3.50
(150 lb. bags)	100 lbs.	2.60	@ 3.15
Soft rubber (c.l.)	100 lbs.	2.40	@ 2.75
(l.c.l.)	100 lbs.		@
Superfine commercial flour (210 lb. bbls.)	100 lbs.	2.55	@ 3.10
(100 lb. bags)	100 lbs.	2.40	@ 2.80
Tire brand, superfine,	100 lbs.	1.90	@ 2.25
Tube brand, velvet	100 lbs.	2.40	@ 2.75
Sulphur chloride	lb.	.03½	@ .04
Vandex (selenium)	lb.		@
(See also Colors—Antimony)			

Waxes

Beeswax, white, com.	lb.	.55	@
carnauba	lb.	.33	@
ceresine, white	lb.	.12½	@
montan	lb.	.07½	@
ozokerite, black	lb.	.28	@
green	lb.	.28	@
Paraffin			
122/124 white crude scale	lb.	.03¾	@
124/126 white crude scale	lb.	.04	@
120/122 fully refined	lb.		@
125/127 fully refined	lb.	.05	@

Rims Approved by Tire & Rim Association

Rim Size	April, 1929 Number	April, 1929 Per Cent	4 Months, 1929 Number	4 Months, 1929 Per Cent
Motorcycle				
24 x 3 "CC"	1,317	0.0	9,038	0.1
24 x 3 Std.	....	..	4,200	0.0
26 x 3 "CC"	527	0.0	1,283	0.0
28 x 3 "CC"	....	..	1,020	0.0
Clincher				
30 x 3½	11,496	0.4	112,420	1.2
18" Balloons				
18 x 4	170,699	6.3	500,712	5.3
18 x 3.25	3,442	0.1	55,785	0.6
18 x 4½	50,500	1.9	134,921	1.4
18 x 5	2,164	0.1	17,387	0.2
19" Balloons				
19 x 2.75	34,486	1.3	147,239	1.6
19 x 3½	97,437	3.6	375,785	4.0
19 x 4	598,213	21.9	1,984,234	21.1
19 x 3.25	56,646	2.1	121,239	1.3
19 x 4½	63,630	2.3	233,160	2.5
19 x 5	402	0.0	35,174	0.4
20" Balloons				
20 x 2.75	689,292	25.3	2,262,867	24.0
20 x 3½	14,665	0.5	56,622	0.6
20 x 4	275,898	10.1	1,016,884	10.8
20 x 4½	52,377	1.9	186,304	2.0
20 x 5	53,743	2.0	185,063	2.0
20 x 6	2,563	0.1	34,455	0.4
20 x 6.75	6,184	0.2	11,795	0.2
21" Balloons				
21 x 2.75	9,134	0.3	81,777	0.9
21 x 3½	31,448	1.2	123,046	1.3
21 x 4	3,517	0.1	28,380	0.3
21 x 4½	3,730	0.1	15,195	0.2
21 x 5	1,218	0.0	1,761	0.0
21 x 6	....	..	1,017	0.0
22" Balloons				
22 x 4	....	..	501	0.0
High Pressure				
30 x 3½—23	4,662	0.2	10,850	0.1
32 x 4½—23	1,911	0.1	17,996	0.2
32 x 4—24	350	0.0	7,166	0.1
34 x 4½—25	198	0.0	2,080	0.0
20" Truck				
30 x 5	373,984	13.7	1,289,990	13.3
32 x 6	65,465	2.4	185,702	2.0
34 x 7	15,340	0.6	60,157	0.7
36 x 8	7,165	0.3	48,120	0.5
40 x 10	....	..	304	0.0
22" Truck				
36 x 7	859	0.0	1,032	0.0
38 x 8	1,635	0.1	2,972	0.0
24" Truck				
34 x 5	....	..	1,804	0.0
36 x 6	4,853	0.2	19,607	0.2
38 x 7	8,777	0.3	20,037	0.2
40 x 8	7,281	0.3	27,952	0.3
44 x 10	....	..	246	0.0
Airplane				
8 x 3SS	54	0.0	200	0.0
12 x 3SS	447	0.0	655	0.0
18 x 3SS	465	0.0	494	0.0
16 x 3½SS	10	0.0	964	0.0
20 x 3½SS	464	0.0	601	0.0
20 x 4SS	395	0.0	401	0.0
20 x 5SS	....	..	211	0.0
20 x 6SS	....	..	357	0.0
20 x 8SS	....	..	396	0.0
24 x 10SS	....	..	109	0.0
18 x 4Cl	856	0.0	3,852	0.0
Totals	2,729,899	..	9,443,519	..

Cotton and Fabrics

AMERICAN COTTON. The price of spot middling cotton on May 1 was 19.55 cents compared with 20.75 cents on April 1. The price advanced strongly the first four days in May, remained close to 19.65 cents during the second week with only minor fluctuations. The third week it held above 19.60 cents and closed the week at 19.80 cents. The advance continued into the fourth week starting at 19.90 cents dropping two days later 18 to 23 points net on reports of improved weather conditions.

Revised estimates by the Crop Reporting Board of the Department of Agriculture place 1928 production at 14,478,000 bales of 500 pounds gross weight. The principal damage in 1928 was by the boll weevil, which caused losses averaging 14.1 per cent in the cotton sections. This was 4.4 per cent less than in 1927 but more than the other years since 1923. The average yield of lint cotton picked per acre in 1928 was 152.9 pounds. Reductions in cotton yield per acre due to various causes was reported to have been 36.4 per cent of a normal or full crop. In 1927 the reported reduction was 38.5 per cent and in 1926 was 29.5 per cent.

EGYPTIAN COTTON. Reports from Egypt indicate about the same acreage as last year for Sakel, with 5 to 10 per cent increase for other varieties. Upper Egyptians have remained steady with comparatively small business done by the first of May. Sakels are neglected and prices easier.

The basis on all staple cottons held steady in April and turned decidedly firm in the second and third weeks of May with a quite general inquiry at the higher basis. Desirable extra-long cotton is scarce and commanding full price. Some mills are considering turning to Upper Egyptians in case their business requiring staples continues. Low grade staples, however, remain cheap with practically no demand.

PIMA COTTON. Pima acreage in Arizona is expected to show an increase of 20 to 30 per cent over that of last season.

Cotton Fabrics

DUCKS, DRILLS, AND OSNABURGS. The demand for these lines of fabric continues to hold strong, but is not so pressing as in the earlier months of the year. The active market is expected to continue, but with less inclination to make commitments into far future months.

RAINCOAT FABRICS. The raincoat business is improving each week because of the rainy spring weather. This year all classes of coats are selling, and there is no prevailing outstanding style as regards fabric.

SHEETING. Demand is moderate, and prices are somewhat lower. There is very little comment about sheeting or bag trade numbers. The activity recently has been all on print cloths.

TIRE FABRICS. The demand for tire fabrics during May is reported moderate, with many sales of small filling-in lots. Both American carded peeler and Egyptian shared in the demand with interest inclined to favor carded peeler. About the middle of the month there was interest in stocks for summer and third-quarter delivery, but little new business developed. Consumption of tire fabric for the first quarter of this year was reported as 20,000,000 pounds per month and in excess of the monthly average of last year indicating heavy orders to come.

Market conditions have not changed materially in the past thirty days. Raw cotton has not varied over a cent up or down from previous levels, and buyers are covering their needs for sixty to ninety days ahead in a conservative way. The production of tires at a high level is consuming fabric rapidly, but the supply is ample.

New York Quotations

May 25, 1929

Drills

38-inch 2.00-yard	*yard*	$0.17½ @
40-inch 3.47-yard		.10¼ @
50-inch 1.52-yard		.23⅜ @
52-inch 1.90-yard		.19½ @
52-inch 2.20-yard		.16⅞ @
59-inch 1.85-yard		.20 @

Ducks

38-inch 2.00-yard D. F.	*yard*	.17¾ @
40-inch 1.45-yard S. F.		.24½ @
72-inch 1.05-yard D. F.		.37½ @
72-inch 16.66-ounce		.40⅞ @
72-inch 17.21-ounce		.42⅜ @

MECHANICAL

Hose and belting	*pound*	.36½ @
Specials		@

TENNIS

52-inch 1.35-yard	*yard*	.26¼ @

Hollands

R.T.5—30-inch	*yard*	.16 @
R.T.7—36-inch		.18 @
R.T.8—40-inch		.20 @
48A—32-inch		.12½ @
48A—40-inch		.15½ @

RED SEAL

36-inch		.15½ @
40-inch		.16½ @
50-inch		.25 @

GOLD SEAL

40-inch, No. 72		.20¾ @
40-inch, No. 80		.22 @

Osnaburgs

40-inch 2.35-yard	*yard*	$0.14⅞ @
40-inch 2.48-yard		.14½ @
40-inch 3.00-yard		.11⅝ @
40-inch 10-oz. part waste	*lb.*	.18 @
40-inch 7-oz.	*lb.*	.12¼ @
37-inch 2.42-yard	*yard*	.14½ @

Raincoat Fabrics

COTTON

Bombazine 64 x 60	*yard*	.11 @
Bombazine 60 x 48		.10 @
Plaids 60 x 48		.12½ @
Plaids 48 x 48		.11½ @
Surface prints 64 x 60		.13½ @
Surface prints 60 x 48		.12½ @
Print cloth, 38½-in., 60 x 48		.06½ @
Print cloth, 38½ in., 64 x 60		.07½ @

Sheetings, 40-inch

48 x 48, 2.50-yard	*yard*	.12½ @
48 x 48, 2.85-yard		.10½ @ .11
64 x 68, 3.15-yard		.11½ @
56 x 60, 3.60-yard		.09½ @
44 x 48, 3.75-yard		.08¼ @ .08½
44 x 40, 4.25-yard		.07⅜ @

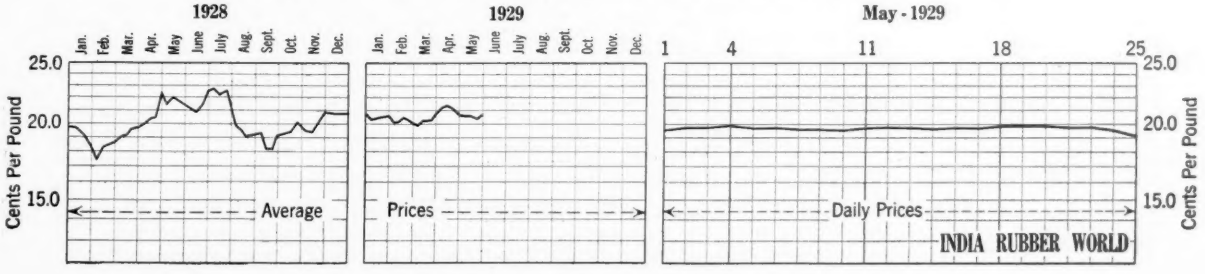
Sheetings, 36-inch

48 x 48, 5.00-yard	*yard*	.06⅝ @
44 x 40, 6.15-yard		.05⅜ @ .05½

Tire Fabrics

SQUARE WOVEN 17¼-ounce		
Peeler, karded	*pound*	$0.47 @
BUILDER 23/11		
Peeler, karded	*pound*	.47 @
BUILDER 10/5		
Peeler, karded	*pound*	.44 @
CORD 23/5/3		
Peeler, karded, 1 1/16-in.	*pound*	.47 @
CORD 23/4/3		
Peeler, karded	*pound*	.49 @
CORD 23/3/5		
Peeler, karded	*pound*	.50 @
CORD 15/3/5		
Peeler, karded	*pound*	.45 @
CORD 13/3/3		
Peeler, karded	*pound*	.44 @
LENO BREAKER		
8-oz. Peeler, karded	*pound*	.47 @
10-oz. Peeler, karded		.47 @
CHAFER		
9.5-oz. Peeler, karded	*pound*	.47 @
12-oz. Peeler, karded		.47 @
14-oz. Peeler, karded		.47 @

Ratio Graph of New York Daily Prices of Spot Middling Upland Cotton



Crude Rubber Arrivals at New York as Reported by Importers

Plantations

Apr. 16. By "City of Bedford," Far East.

	Cases
H. A. Astlett & Co.	3,521
Baird Rubber & Trading Co., Inc.	556
Bierrie & Co., Inc.	893
General Rubber Co.	8,791
B. W. Henderson & Co., Inc.	285
Hood Rubber Co.	*70
Littlejohn & Co., Inc.	2,634
The Meyer & Brown Corp.	1,461
The Meyer & Brown Corp.	*229
H. Muehlstein & Co., Inc.	2,900
Poel & Kelly, Inc.	201
Raw Products Co.	66
Rogers Brown & Crocker Bros., Inc.	821
Chas. T. Wilson Co., Inc.	652

Apr. 16. By "Pyrrhus," Far East.

B. W. Henderson & Co., Inc.	275

Apr. 16. By "Silver Fir," Far East.

Baird Rubber & Trading Co., Inc.	†250

Apr. 18. By "Ruth Alexander," Far East.

H. A. Astlett & Co.	1,914
Robert Badenhop Corp.	1,140
Baird Rubber & Trading Co., Inc.	735
Bierrie & Co., Inc.	100
General Rubber Co.	5,521
B. W. Henderson & Co., Inc.	42
Lavino American & Asiatic Co.	50
Littlejohn & Co., Inc.	782
The Meyer & Brown Corp.	1,310
The Meyer & Brown Corp.	*150
Poel & Kelly, Inc.	194
Raw Products Co.	230
Rogers Brown & Crocker Bros., Inc.	485
Rogers Brown & Crocker Bros., Inc.	*200
Chas. T. Wilson Co., Inc.	793

Apr. 18. By "Steel Worker," Far East.

H. A. Astlett & Co.	1,816
Robert Badenhop Corp.	175
Baird Rubber & Trading Co., Inc.	1,030
Bierrie & Co., Inc.	100
General Rubber Co.	6,515
Haldane & Co., Inc.	600
B. W. Henderson & Co., Inc.	212
Lavino American & Asiatic Co.	160
Littlejohn & Co., Inc.	1,588
The Meyer & Brown Corp.	993
The Meyer & Brown Corp.	*174
H. Muehlstein & Co., Inc.	2,200
Poel & Kelly, Inc.	530
Raw Products Co.	150
Rogers Brown & Crocker Bros., Inc.	650
Rogers Brown & Crocker Bros., Inc.	*300
Chas. T. Wilson Co., Inc.	1,175

Apr. 19. By "Statendam," Europe.

H. A. Astlett & Co.	20
Littlejohn & Co., Inc.	188

Apr. 21. By "Pres. Jefferson," Far East.

H. A. Astlett & Co.	†100
Haldane & Co., Inc.	†250
Littlejohn & Co., Inc.	†385
The Meyer & Brown Corp.	†330
Poel & Kelly, Inc.	†150

Apr. 22. By "Goldentide," Far East.

The Meyer & Brown Corp.	†1,000

Apr. 22. By "Mahout," Far East.

H. A. Astlett & Co.	400
Robert Badenhop Corp.	53
General Rubber Co.	280
The Meyer & Brown Corp.	2,383
H. Muehlstein & Co., Inc.	1,100
Raw Products Co.	110
Rogers Brown & Crocker Bros., Inc.	112

Apr. 24. By "Boschdyk," Far East.

H. A. Astlett & Co.	2,677
Robert Badenhop Corp.	1,394
Bierrie & Co., Inc.	191
General Rubber Co.	7,843
Haldane & Co., Inc.	168
B. W. Henderson & Co., Inc.	147
Lavino American & Asiatic Co.	100
Littlejohn & Co., Inc.	720
The Meyer & Brown Corp.	1,599
The Meyer & Brown Corp.	*271
H. Muehlstein & Co., Inc.	2,100
Poel & Kelly, Inc.	569
Raw Products Co.	203
Rogers Brown & Crocker Bros., Inc.	779
Chas. T. Wilson Co., Inc.	1,105

Apr. 24. By "Caronia," Far East.

	Cases
General Rubber Co.	55

Apr. 24. By "City of Dundee," Far East.

H. A. Astlett & Co.	141
Robert Badenhop Corp.	224
Baird Rubber & Trading Co., Inc.	216
Bierrie & Co., Inc.	210
General Rubber Co.	933
Haldane & Co., Inc.	42
Littlejohn & Co., Inc.	966
The Meyer & Brown Corp.	1,675
The Meyer & Brown Corp.	*400
Poel & Kelly, Inc.	480
Rogers Brown & Crocker Bros., Inc.	282
Chas. T. Wilson Co., Inc.	298

Apr. 25. By "Japanese Prince," Far East.

H. A. Astlett & Co.	4,380
Robert Badenhop Corp.	1,902
Baird Rubber & Trading Co., Inc.	174
Bierrie & Co., Inc.	205
General Rubber Co.	13,704
Haldane & Co., Inc.	307
Hood Rubber Co.	*143
Littlejohn & Co., Inc.	6,282
The Meyer & Brown Corp.	1,801
The Meyer & Brown Corp.	*165
H. Muehlstein & Co., Inc.	1,300
Poel & Kelly, Inc.	>90
Poel & Kelly, Inc.	*100
Raw Products Co.	398
Rogers Brown & Crocker Bros., Inc.	2,968
Chas. T. Wilson Co., Inc.	1,589

Apr. 26. By "Steel Engineer," Far East.

H. A. Astlett & Co.	100
General Rubber Co.	319
The Meyer & Brown Corp.	454
Rogers Brown & Crocker Bros., Inc.	56
Chas. T. Wilson Co., Inc.	84

Apr. 28. By "Algic," Far East.

Bierrie & Co., Inc.	112
General Rubber Co.	1,120
Littlejohn & Co., Inc.	224
The Meyer & Brown Corp.	106

Apr. 28. By "Roxen," Far East.

The Meyer & Brown Corp.	50

Apr. 28. By "Silverguava," Far East.

H. A. Astlett & Co.	4,592
Baird Rubber & Trading Co., Inc.	1,855
Bierrie & Co., Inc.	100
General Rubber Co.	13,135
Haldane & Co., Inc.	650
Hood Rubber Co.	68
Lavino American & Asiatic Co.	50
Littlejohn & Co., Inc.	5,243
The Meyer & Brown Corp.	1,045
The Meyer & Brown Corp.	*275
H. Muehlstein & Co., Inc.	2,300
Poel & Kelly, Inc.	700
Raw Products Co.	80
Rogers Brown & Crocker Bros., Inc.	410
Chas. T. Wilson Co., Inc.	1,019

Apr. 29. By "Clan Morrison," Far East.

H. A. Astlett & Co.	105
The Meyer & Brown Corp.	300
Poel & Kelly, Inc.	67

Apr. 29. By "Legie," Far East.

Hood Rubber Co.	*160

Apr. 29. By "Pres. Garfield," Far East.

H. A. Astlett & Co.	2,720
Robert Badenhop Corp.	667
Baird Rubber & Trading Co., Inc.	78
Bierrie & Co., Inc.	506
General Rubber Co.	5,753
Haldane & Co., Inc.	400
Hood Rubber Co.	76
Lavino American & Asiatic Co.	22
Littlejohn & Co., Inc.	3,641
The Meyer & Brown Corp.	930
The Meyer & Brown Corp.	*110
H. Muehlstein & Co., Inc.	2,200
Poel & Kelly, Inc.	150
Rogers Brown & Crocker Bros., Inc.	1,495
Chas. T. Wilson Co., Inc.	597

Apr. 29. By "Tengo Maru," Far East.

The Meyer & Brown Corp.	203

Apr. 30. By "Minnekahda," London.

General Rubber Co.	200
Chas. T. Wilson Co., Inc.	576

May 2. By "Kabinga," Far East.

H. A. Astlett & Co.	3,782
Robert Badenhop Corp.	470
Baird Rubber & Trading Co., Inc.	200
Bierrie & Co., Inc.	380
General Rubber Co.	5,809
Haldane & Co., Inc.	375
Lavino American & Asiatic Co.	50
Littlejohn & Co., Inc.	3,664
The Meyer & Brown Corp.	2,471
The Meyer & Brown Corp.	*730
H. Muehlstein & Co., Inc.	234
Poel & Kelly, Inc.	2,055
Raw Products Co.	500
Rogers Brown & Crocker Bros., Inc.	950
Chas. T. Wilson Co., Inc.	651

May 2. By "Myrtlebank," Far East.

H. A. Astlett & Co.	955
Robert Badenhop Corp.	835
Baird Rubber & Trading Co., Inc.	730
Bierrie & Co., Inc.	100
General Rubber Co.	5,182
Littlejohn & Co., Inc.	2,999
The Meyer & Brown Corp.	584
Poel & Kelly, Inc.	610
Poel & Kelly, Inc.	*100
Raw Products Co.	150
Rogers Brown & Crocker Bros., Inc.	1,345
Chas. T. Wilson Co., Inc.	338

May 2. By "Siantar," Far East.

H. A. Astlett & Co.	†890
The Meyer & Brown Corp.	†717

May 2. By "Tampa," Far East.

General Rubber Co.	350

May 5. By "Pres. Lincoln," Far East.

Robert Badenhop Corp.	†1,493
The Meyer & Brown Corp.	†250

May 5. By "Silver Spruce," Far East.

Littlejohn & Co., Inc.	†550
The Meyer & Brown Corp.	†1,235

May 6. By "Albert Ballin," Far East.

Bierrie & Co., Inc.	100

May 6. By "American Merchant," London.

Rogers Brown & Crocker Bros., Inc.	1,131

May 6. By "Minnewaska," London.

General Rubber Co.	190
Lavino American & Asiatic Co.	120

May 8. By "Agapenor," Far East.

H. A. Astlett & Co.	3,677
Robert Badenhop Corp.	1,220
Baird Rubber & Trading Co., Inc.	1,300
Bierrie & Co., Inc.	1,170
General Rubber Co.	11,246
Haldane & Co., Inc.	690
Lavino American & Asiatic Co.	700
Littlejohn & Co., Inc.	5,906
The Meyer & Brown Corp.	2,011
The Meyer & Brown Corp.	*51
H. Muehlstein & Co., Inc.	490
Poel & Kelly, Inc.	755
Poel & Kelly, Inc.	*250
Raw Products Co.	50
Rogers Brown & Crocker Bros., Inc.	1,050
Rogers Brown & Crocker Bros., Inc.	*98
Chas. T. Wilson Co., Inc.	740

May 8. By "Albertic," Far East.

General Rubber Co.	150

May 8. By "Steel Seafarer," Far East.

H. A. Astlett & Co.	4,240
Robert Badenhop Corp.	792
Baird Rubber & Trading Co., Inc.	200
Bierrie & Co., Inc.	50
General Rubber Co.	6,123
Haldane & Co., Inc.	750
Lavino American & Asiatic Co.	275
Littlejohn & Co., Inc.	4,034
The Meyer & Brown Corp.	1,771
The Meyer & Brown Corp.	*275
Poel & Kelly, Inc.	1,000
Raw Products Co.	80
Rogers Brown & Crocker Bros., Inc.	827
Chas. T. Wilson Co., Inc.	1,000

May 9. By "City of Hereford," Far East.

Robert Badenhop Corp.	112
Bierrie & Co., Inc.	112
General Rubber Co.	80
Littlejohn & Co., Inc.	38
The Meyer & Brown Corp.	122
Poel & Kelly, Inc.	35
Chas. T. Wilson Co., Inc.	628

May 9. By "Manaar," Far East.

Baird Rubber & Trading Co., Inc.	56
Bierrie & Co., Inc.	280
General Rubber Co.	1,039
Littlejohn & Co., Inc.	987
The Meyer & Brown Corp.	554
Raw Products Co.	100
Chas. T. Wilson Co., Inc.	231

May 10. By "Elmbank," Far East.

H. A. Astlett & Co.	2,758
Robert Badenhop Corp.	267
Baird Rubber & Trading Co., Inc.	200
Bierrie & Co., Inc.	330

*Arrived at Boston.

†Arrived at Los Angeles.

	Cases
General Rubber Co.	4,483
Haldane & Co., Inc.	428
Littlejohn & Co., Inc.	2,936
The Meyer & Brown Corp.	1,615
H. Muehlstein & Co., Inc.	420
Poel & Kelly, Inc.	400
Poel & Kelly, Inc.	*250
Raw Products Co.	110
Rogers Brown & Crocker Bros., Inc.	190
Chas. T. Wilson Co., Inc.	646
MAY 10. By "Lorenzo," Far East.	
H. A. Astlett & Co.	659
Bierrie & Co., Inc.	462
General Rubber Co.	460
Littlejohn & Co., Inc.	822
The Meyer & Brown Corp.	504
The Meyer & Brown Corp.	*70
Raw Products Co.	112
Rogers Brown & Crocker Bros., Inc.	329
Chas. T. Wilson Co., Inc.	70
MAY 10. By "Niew Amsterdam," Europe.	
The Meyer & Brown Corp.	136
MAY 11. By "Dolius," Far East.	
H. A. Astlett & Co.	2,825
Robert Badenhop Corp.	500
Baird Rubber & Trading Co., Inc.	64
Baird Rubber & Trading Co., Inc.	*50
Bierrie & Co., Inc.	558
General Rubber Co.	9,246
Haldane & Co., Inc.	180
Hood Rubber Co.	*74
Lavino American & Asiatic Co.	50

*Arrived at Boston.
†Arrived at Los Angeles.

	Cases
Littlejohn & Co., Inc.	3,058
The Meyer & Brown Corp.	963
The Meyer & Brown Corp.	*325
Poel & Kelly, Inc.	992
Rogers Brown & Crocker Bros., Inc.	660
Chas. T. Wilson Co., Inc.	152
MAY 13. By "Korea Maru," Far East.	
The Meyer & Brown Corp.	†100
MAY 13. By "Minnesota," London.	
Chas. T. Wilson Co., Inc.	583
MAY 13. By "Pres. Johnson," Far East.	
H. A. Astlett & Co.	1,927
Robert Badenhop Corp.	450
Baird Rubber & Trading Co., Inc.	759
Bierrie & Co., Inc.	664
General Rubber Co.	6,180
Haldane & Co., Inc.	500
Littlejohn & Co., Inc.	4,497
The Meyer & Brown Corp.	2,425
H. Muehlstein & Co., Inc.	2,100
Poel & Kelly, Inc.	780
Rogers Brown & Crocker Bros., Inc.	320
Chas. T. Wilson Co., Inc.	457
MAY 13. By "Tuscania," Europe.	
Littlejohn & Co., Inc.	377
MAY 14. By "Scythia," London.	
H. A. Astlett & Co.	140
Chas. T. Wilson Co., Inc.	105
MAY 15. By "Silverbeech," Far East.	
H. A. Astlett & Co.	3,476
Robert Badenhop Corp.	1,154

	Cases
Bierrie & Co., Inc.	475
Haldane & Co., Inc.	450
B. W. Henderson & Co., Inc.	260
Littlejohn & Co., Inc.	5,474
The Meyer & Brown Corp.	*325
Poel & Kelly, Inc.	250
Rogers Brown & Crocker Bros., Inc.	699

Africans

APR. 30. By "Lancastria," Europe.	
Littlejohn & Co., Inc.	6

Guayule

APR. 26. By "El Dia," Mexico.	
Continental Rubber Co. of N. Y.	560
APR. 30. By "El Mundo," Mexico.	
Continental Rubber Co. of N. Y.	560
MAY 13. By "El Oriente," Mexico.	
Continental Rubber Co. of N. Y.	560
MAY 14. By "El Occidente," Mexico.	
Continental Rubber Co. of N. Y.	1,120

Balata

MAY 7. By "Swinburne," South America.	
Paul Bertuch & Co., Inc.	41

Rubber Latex

MAY 10. By "Lorenzo," Far East.	
General Rubber Co.	gals. 65,528

Paras and Caucho

	Fine Cases	Medium Cases	Coarse Cases	Caucho Cases	Miscel. Cases
APR. 19. By "Newton," South America.					
H. A. Astlett & Co.	25	....	....	....	....
Paul Bertuch & Co., Inc.	460	....	....	155	....
Littlejohn & Co., Inc.	240	....	....	....	....
APR. 23. By "South Cross," South America.					
Paul Bertuch & Co., Inc.	13	....	....	....	....
APR. 25. By "Pancras," South America.					
H. A. Astlett & Co.	130	....	73	....	....
Paul Bertuch & Co., Inc.	175	....	....	....	....
General Rubber Co.	640	4	186	165	18
Littlejohn & Co., Inc.	463	....	....	....	....
The Meyer & Brown Corp.	248	....	....	228	....
MAY 1. By "Biboco," South America.					
H. A. Astlett & Co.	39	....	....	....	....
MAY 7. By "Swinburne," South America.					
H. A. Astlett & Co.	322	....	99	147	....
General Rubber Co.	189	9	181	164	....
The Meyer & Brown Corp.	93	167	....	375	....

United States Crude and Waste Rubber Imports for 1929 by Months

1929	Plantations	Paras	Africans	Centrals	Guayule	Manicobas and Matto Grosso	Total 1929	Total 1928	Balata	Miscellaneous	Waste
January ..... tons	51,202	1,055	30	5	....	13	52,305	46,243	67	799	181
February	63,851	530	60	97	....	....	64,538	29,445	80	1,220	319
March	51,661	2,112	15	36	....	....	53,824	40,894	85	825	70
April	53,256	844	8	4	59	....	54,171	37,240	87	1,606	609
Total four months, 1929 ..... tons	219,970	4,541	113	142	59	13	224,838	.....	319	4,450	1,179
Total four months, 1928 ..... tons	145,173	5,339	645	363	2,301	1	.....	153,822	534	3,438	1,406

Compiled from Rubber Association statistics.

British Malaya

RUBBER EXPORTS

An official cable from Singapore to the Malay States Information Agency, 57, Charing Cross, London, S. W. 1, England, states that the amount of rubber exported from British Malaya in April last totaled 49,816 tons, as compared with 49,448 tons in March last, and 20,029 tons in the corresponding period of 1928. The amount of rubber imported was 11,414 tons, of which 8,141 tons were declared as wet rubber. The following are comparative statistics:

	1928		1929	
	Gross Exports Tons	Foreign Imports Tons	Gross Exports Tons	Foreign Imports Tons
January	27,731	16,618	52,546	13,415
February	28,813	12,911	47,926	12,103
March	27,813	10,508	49,448	14,553
April	20,029	9,335	49,816	11,414
Totals	104,386	49,372	199,736	51,485

The above figures represent the totals compiled from declarations received up to the last day of the month for export from and import to all ports of British Malaya, and not necessarily the actual quantity shipped or landed during that month.

DISTRIBUTION

The following is a comparative return of distribution of shipments during the months of March and April, 1929:

	Mar., 1929 Tons	Apr., 1929 Tons
United Kingdom	6,899	6,921
United States	33,210	34,634
Continent of Europe	5,547	5,080
British Possessions	1,027	1,170
Japan	2,589	1,912
Other foreign countries	176	99
Totals	49,448	49,816

Plantation Rubber Exports from Malaya*

January 1 to February 28, 1929

	From Singapore Tons	From Penang Tons	From Malacca Tons
To United Kingdom	800.00	1,633.00	1,544.00
British Possessions	743.00	102.00	72.00
Continent of Europe	4,665.00	1,669.00	1,260.00
United States	32,231.00	9,768.00	4,495.00
Japan	4,138.00	10.00	153.00
Other countries	156.00	..	..
Totals	42,733.00	13,182.00	7,524.00

*Excluding all foreign transhipment.

Crude Rubber Imports by Customs Districts

	*March, 1929		Three Months Ended *March, 1929	
	Pounds	Value	Pounds	Value
Massachusetts	3,118,609	$596,816	10,983,251	$1,913,006
New York	97,388,060	17,592,513	333,029,985	58,814,359
Philadelphia	590,275	96,227	1,465,605	242,608
Maryland	4,354,837	733,585	10,683,627	1,868,331
Los Angeles	4,008,138	729,327	17,232,312	3,033,435
San Francisco	182,542	43,212	463,821	104,679
Oregon	11,200	1,914	44,800	7,652
Ohio	3,476,906	551,446	11,672,637	1,909,173
Colorado	235,200	38,433	772,800	137,724
Totals	113,365,767	$20,383,473	386,348,838	$68,030,967

*Including latex, dry rubber content.

United States Statistics

IMPORTS OF CRUDE AND MANUFACTURED RUBBER

	February, 1929		Two Months Ended February, 1929	
	Pounds	Value	Pounds	Value
UNMANUFACTURED—*Free*				
Crude rubber	143,953,780	$24,760,111	*272,983,071	*$47,647,494
Liquid latex	46,964	9,454	.....	.....
Balata	184,172	70,209	296,323	104,504
Jelutong or Pontianak	1,843,012	255,594	2,927,434	407,854
Gutta percha	89,839	19,806	399,371	82,756
Siak, scrap and reclaimed	1,388,558	30,120	3,329,488	72,269
Totals	147,506,325	$25,145,294	279,935,687	$48,314,877
Chicle *dutiable*	1,360,953	$667,665	2,527,120	$1,241,761
MANUFACTURED—*Dutiable*				
Belting	5,227	$2,251	6,404	$3,130
Tires	19	345	40	867
Other manufactures of rubber	.....	156,348	.....	369,061
Totals	5,246	$158,944	6,444	$373,058

EXPORTS OF FOREIGN MERCHANDISE

RUBBER AND MANUFACTURES				
Crude rubber	6,619,636	$1,374,783	14,825,497	$3,148,184
Balata	3,603	1,501	37,396	14,811
Gutta percha, rubber substitutes and scrap	.....	.....	22,473	4,045
Rubber manufactures	.....	7,135	.....	11,920
Totals	6,623,239	$1,383,419	14,885,366	$3,178,960

EXPORTS OF DOMESTIC MERCHANDISE

MANUFACTURED				
Reclaimed	2,303,445	$169,452	4,411,541	$308,862
Scrap and oil	3,772,908	208,149	8,056,226	396,655
Rubberized automobile cloth, *sq. yd.*	295,422	141,441	481,529	239,711
Other rubberized piece goods and hospital sheeting, *sq. yd.*	130,825	55,337	283,822	129,067
Footwear				
Boots *pairs*	76,854	185,812	173,394	389,572
Shoes *pairs*	151,663	125,254	320,784	277,293
Canvas shoes with rubber soles *pairs*	462,880	286,422	1,083,948	675,424
Soles *doz. pairs*	63,493	45,785	80,830	86,229
Heels *doz. pairs*	130,531	95,413	263,605	202,775
Water bottles and fountain syringes *number*	30,119	24,576	73,488	54,454
Gloves *doz. pairs*	7,419	18,705	14,342	37,473
Other druggists' sundries	.....	28,737	.....	69,215
Balloons *gross*	65,338	62,686	127,686	128,447
Toys and balls	.....	12,541	.....	24,400
Bathing caps *doz.*	12,450	32,234	19,710	54,621
Bands	43,721	21,423	95,816	48,778
Erasers	48,329	31,117	94,763	60,424
Hard rubber goods				
Electrical goods	242,543	34,252	367,579	51,368
Other goods	.....	18,558	.....	57,673
Tires				
Casings, auto *number*	305,709	3,602,771	595,547	6,893,315
Truck and bus casings, 6 inches and over, *number*	24,732	654,850	51,259	1,273,701
Other automobile casings *number*	280,977	2,947,921	544,288	5,619,614
Tubes, auto *number*	198,649	363,277	398,968	692,214
Other casings and tubes *number*	8,506	17,682	30,483	80,082
Solid tires for automobiles and motor trucks, *number*	4,577	134,637	9,086	273,778
Others	108,954	20,386	230,111	45,576
Tire accessories	.....	144,244	.....	274,002
Rubber and friction tape	157,672	43,160	305,191	89,947
Belting	412,493	222,584	849,600	453,984
Hose	755,049	260,938	1,504,177	517,014
Packing	200,104	99,651	435,556	205,003
Thread	176,541	195,238	272,493	302,227
Other rubber manufactures	.....	313,150	.....	667,653
Totals	.....	$10,618,383	.....	$20,680,551

*Liquid latex included.

London Stocks, March, 1929

	Landed for Mar. Tons	Delivered for Mar. Tons	Stocked March 31		
			1929 Tons	1928 Tons	1927 Tons
LONDON					
Plantation	9,105	6,464	28,080	58,108	62,851
Other grades	14	6	83	119	132
LIVERPOOL					
Plantation	1,073	†852	†4,326	†2,133	†2,579
Total tons, London and Liverpool	10,192	7,322	32,489	60,360	65,562

†Official returns from the seven recognized public warehouses.

United Kingdom Statistics

IMPORTS

	March, 1929		Three Months Ended March, 1929	
UNMANUFACTURED				
Crude Rubber				
From—	Pounds	Value	Pounds	Value
Straits Settlements	12,774,800	£655,854	41,831,300	£1,804,715
Federated Malay States	6,358,300	319,062	18,999,800	839,906
British India	1,006,700	51,378	3,638,300	166,272
Ceylon and Dependencies	3,724,300	195,586	10,816,100	497,882
Other Dutch possessions in Indian Seas	3,179,600	166,129	7,564,000	354,005
Dutch East Indies (except other Dutch possessions in Indian Seas)	2,092,600	105,394	5,664,600	253,535
Other countries in East Indies and Pacific not elsewhere specified	209,200	9,855	524,600	23,001
Brazil	396,300	18,538	2,197,800	95,777
South and Central America (except Brazil)	16,800	840	40,300	1,655
West Africa				
French West Africa	51,900	1,288	52,100	1,294
Gold Coast	56,100	2,769	120,200	5,232
Other parts of West Africa	279,600	12,568	727,400	30,394
East Africa, including Madagascar	72,300	3,521	232,100	10,273
Other countries	18,800	890	207,700	8,647
Totals	30,237,300	£1,543,672	92,616,300	£4,092,588
Gutta percha and balata	354,400	25,746	1,574,500	112,702
Waste and reclaimed rubber	810,800	9,342	2,514,000	27,571
Rubber substitutes	7,100	140	21,500	447
Totals	31,409,600	£1,578,900	96,726,300	£4,233,308
MANUFACTURED				
*††Tires and tubes				
Pneumatic				
Outer covers	.....	£57,045	.....	£152,023
Inner tubes	.....	6,629	.....	21,855
Solid tires	.....	8,029	.....	21,548
Boots and shoes *doz. pairs*	123,509	149,375	274,879	350,008
Other rubber manufactures	.....	181,392	.....	484,856
Totals	.....	£402,470	.....	£1,030,290

EXPORTS

UNMANUFACTURED				
Waste and reclaimed rubber	2,403,100	£17,899	8,681,200	£62,989
Rubber substitutes	86,800	1,971	200,700	4,226
Totals	2,489,900	£19,870	8,881,900	£67,215
MANUFACTURED				
‡Tires and tubes				
Pneumatic				
Outer covers	.....	£257,214	.....	£732,121
Inner tubes	.....	41,882	.....	120,290
Solid tires	.....	9,737	.....	36,462
Boots and shoes *doz. pairs*	26,737	44,253	65,755	112,248
Other rubber manufactures	.....	221,749	.....	674,302
Totals	.....	£574,835	.....	£1,675,423

EXPORTS—COLONIAL AND FOREIGN

UNMANUFACTURED				
Crude Rubber				
To—				
Russia	600	£37	1,291,900	£51,896
Sweden, Norway and Denmark	89,900	4,969	609,800	27,226
Germany	3,039,600	143,177	8,964,200	372,861
Belgium	864,300	37,015	2,660,100	109,655
France	3,427,200	168,988	11,185,800	483,310
Spain	59,100	3,563	610,000	27,472
Italy	978,100	44,229	2,602,900	121,849
Other European countries	611,500	32,086	1,823,100	79,641
United States	676,700	27,431	3,652,800	148,284
Other countries	176,900	9,138	532,900	26,835
Totals	9,923,900	£470,633	33,933,500	£1,449,029
Gutta percha and balata	95,700	7,477	403,200	26,293
Waste and reclaimed rubber	5,000	133	92,200	1,372
Rubber substitutes	.....	.....	700	38
Totals	10,024,600	£478,243	34,429,600	£1,476,732
MANUFACTURED				
*‡Tires and tubes				
Pneumatic				
Outer covers	.....	£1,696	.....	£17,245
Inner tubes	.....	259	.....	2,597
Solid tires	.....	.....	.....	386
Boots and shoes *doz. pairs*	1,213	3,506	2,820	7,836
Other rubber manufactures	.....	5,692	.....	18,242
Totals	.....	£11,153	.....	£46,306

*After April 12, 1927, tires and tubes imported or exported with complete vehicles or chassis, or fitted to wheels imported separately, are included under complete vehicles or parts.

†Motor cars, motorcycles, parts and accessories, liable to duty from Sept. 29, 1915, until Aug. 1, 1924, inclusive, and after July 1, 1925. Commercial vehicles, parts and accessories were exempt from duty until Apr. 30, 1926, inclusive, and rubber tires and tubes until Apr. 11, 1927, inclusive.

‡Tires and tubes included prior to Apr. 12, 1927.